MECHANICS · AUTOS · HOMEBUILDING

POPULAR SCIENCE

February 35¢ MONTHLY

New Packard Makes Every Road Smooth

PAGE 154

Four Spring Features:

Brighten Up Your Home

PAGES 99 TO 114

This is the kitchen

My name is Saturday (mechanic)

I'm a husband

The sink top is rotted

My job.....

FIX IT !

9:01 A.M.	I ripped off the old surface.
9:57 A.M.	Scraped the plywood core of the sink top clean of old mastic.
10:32 A.M.	Went to my lumber dealer to buy Formica.
10:33 A.M.	Looked for the Formica Trade-Mark on the sheets to be sure it was genuine--It was.
11:05 A.M.	Marked and sawed Formica to size for new top and backsplash. Used carpenter's saw--worked fine.
12:15 P.M.	Spread Formica Contact Bond Cement on back of Formica and on plywood core.
12:44 P.M.	Knocked off for lunch while cement was drying.
1:30 P.M.	Applied cemented back of Formica to cemented top of cabinets. Used ordinary rolling pin.
1:51 P.M.	Filed edges of Formica, applied metal moldings.
2:30 P.M.	Had a beer. Accepted kiss from lady of the house. CASE SOLVED.

Formica samples and complete illustrated instructions for doing-it-yourself with Formica. Write to The Formica Company, 4595 Spring Grove Ave., Cincinnati 32, O.

DEMAND THIS CERTIFICATION

This mark certifies genuine FORMICA

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Guaranteed by Good Housekeeping

Pays in Performance

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Guaranteed by Good Housekeeping

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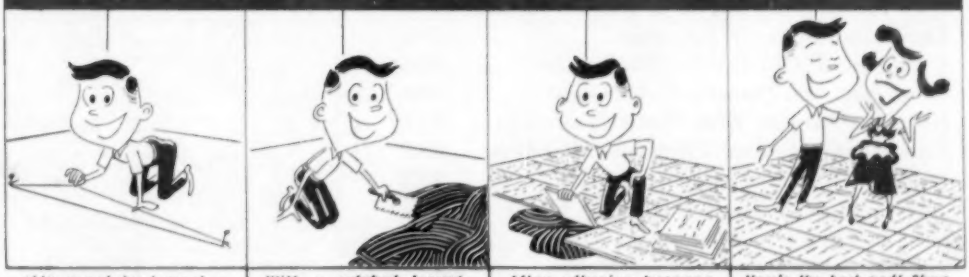

It's easy! Just mark a straight line through the center of your room in both directions, using a chalk and line. Be careful not to cover up your guide lines.

With a notched trowel, spread adhesive over one-half of your room at a time. leave only a thin coat of adhesive on the floor.

After adhesive becomes tacky, snap the tiles into place. Do not slide tiles or adhesive will push up between the tiles.

Here's the best part! Show your wife your handiwork. (Don't tell her what a cinch it is with MATICO's easy-to-follow instructions).

America's Leading New-Idea Magazine for 83 Years

Founded 1872,
Vol. 166: No. 2

POPULAR SCIENCE
REG. U.S. PAT. OFF. Monthly

Mechanics and Handicraft
REG. U.S. PAT. OFF.

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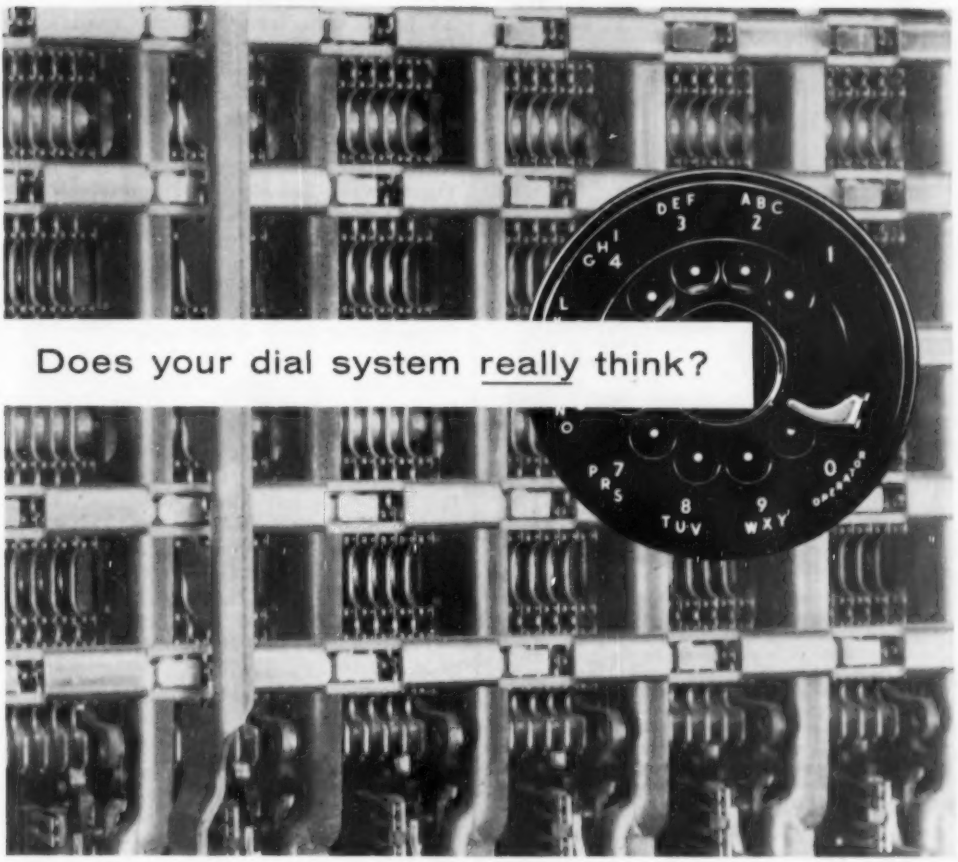

Part of the control equipment of a modern dial system—dial telephony's equivalent of a brain. It goes into action the instant you dial a call, selecting the telephone you want to reach and directing the switches that set up the connection . . . just as the brain directs the muscular actions of the body.

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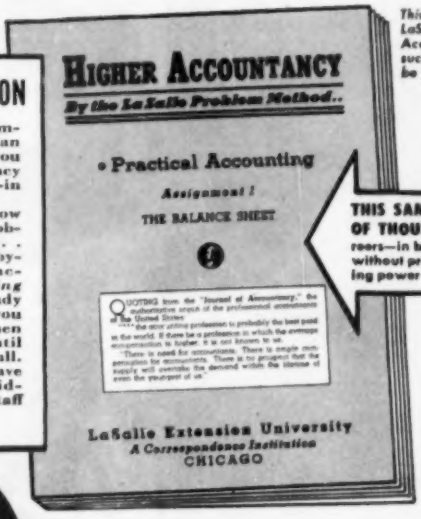

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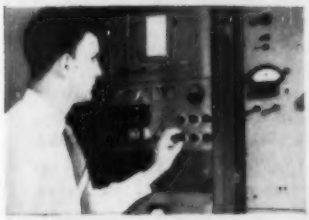

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Letters

Who's Spoofing Whom?

All those reports of flying saucers being sighted recently in Europe started me thinking. And when our Air Force said it was going to look into this strange business, a light went on inside my head.

Could the saucers be "spoofing devices" —new kinds of defense weapons that can create false targets in the sky? The false targets would trick enemy guided missiles into exploding harmlessly in the air instead of on cities and military installations—real targets—on the ground.

We know that guided missiles can aim themselves by radar, optical or heat devices. They hunt and follow a certain shape (like an airplane) or a certain heat pattern (like an engine or an industrial plant) or lights (starlight or an illuminated city).

Now it shouldn't be too difficult to imitate what the missiles are looking for. There might be a way to throw the heat, light or electrical pattern into the air, either from the ground or from planes. There might be expendable defense missiles arranged to appear to the attacking missile's guidance system like a city or a factory.

I don't know, of course, that our military is doing any such thing. And the military certainly isn't talking. But spoofers would surely explain a lot—particularly why so many saucers have been sighted over important defense bases.

THOMAS C. DEMARS, East Berlin, Conn.

Well, your theory sounds plausible, but how are you going to explain the fact that there have been similar sightings for hundreds of years (May '52, p. 45)?

Columbus' Ship Was a Tub

Henry B. Comstock's "3 Men and a Ship Kit" (Dec. '54, p. 183) expresses the finest traditions of model building. But why didn't

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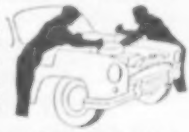

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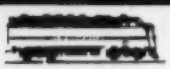

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Super-Scale Smith buy the enlarged plans of the *Santa Maria*, which are on the market for $1.50, and then have them photostated to any size he wanted?

WILLIAM T. MOON, New York

Unfortunately, Super-Scale Smith didn't know about those plans. But he doesn't regret the time he spent on research, for now he knows that practically every model of Columbus' flagship is based on a wholly inaccurate replica exhibited at the 1893 World's Fair in Chicago. The real Santa Maria *was a clumsy carrack, an ugly tub.*

Tribute from the Transvaal

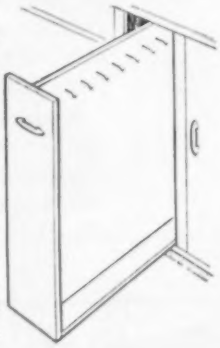
I am a practicing Christian and do not see my way clear to read all types of secular magazines. I do, however, enjoy and find relaxation in your monthly magazine. I only wish that it did not cost so much out here in South Africa. At any rate, it is worth it, and I enjoy going through every article and all the ads.

JAN D. ELS, Eureka, South Africa

Building Kitchen Cabinets

The article you published last September (p. 112) on building kitchen cabinets will be very helpful when I modernize our kitchen next summer. But I wish you had included something on the pull-out storage racks that are seen in so many modern kitchens. Know where I could find plans for these?

HERBERT TEETZ, Philadelphia



You'll find plans for these, and many other types of kitchen cabinets, in How to Build Cabinets for the Modern Kitchen, *a new book by R. P. Stevenson, assistant managing editor of* POPULAR SCIENCE MONTHLY. *It is published by Simmons-Boardman Publishing Corp., 30 Church St., NYC 7.*

"Rash" Was a Wise Choice

"Do people still give their cars names?" you asked in the December letters column.

Answer: "Yes."

I was a Fulbright exchange teacher in England in 1951. My wife and I decided

INVENTORS

If you believe that you have an invention, you should find out how to protect it. The first step is to have a search made of the prior pertinent U. S. patents. If a report on this search indicates that the invention appears patentable you can apply for a patent, and the specifications and claims should be prepared.

The firm of McMorrow, Berman & Davidson, with offices in Washington, D. C., is qualified to take the necessary steps for you. We can make a preliminary search on your invention, advise you whether we think it can be patented, and prepare your application for patent.

Unless you are fully familiar with the U. S. Patent Laws, we recommend that you engage the services of a Registered Patent Attorney to protect your interests. The patent laws are *your* laws. A patent gives you the right to prevent others from making, using or selling the invention claimed in your patent for a period of 17 years.

Use these patent laws for your protection. Investigate whether your invention can be patented. If you have what you believe to be an invention, we suggest that you have this firm make a search for you.

Send for a copy of our Patent Booklet entitled "How To Protect Your Invention," containing information about patent protection and patent procedure. Along with this we will also send you an "Invention Record" form, for your use in writing down and sketching details of your invention. We will mail them promptly. No obligation. They are yours for the asking.

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142-A VICTOR BUILDING, WASHINGTON 1, D. C.

that if we wanted to see Europe on a teacher's salary, we should purchase a car. In spite of inflation and all advice to the contrary, we bought a 12-horsepower English Austin, 1938 model. Knowing all our arguments were rationalization, we called the car Rash.

The name proved to be ill-chosen, for we drove her 20,000 miles, toured 18 countries, saved hundreds of dollars on travel cost, and with tears in our eyes sold Rash for $110 profit when we left England.

K. Deane Stout, Knoxville, Tenn.

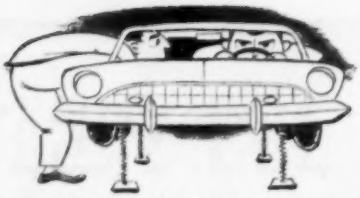
Cynics Leer at '55 Cars

When they get around to putting retractable wings on our new "brute" cars (Dec. '54, p. 135), will the driver need a pilot's license?

C. McAteer, Staten Island, N.Y.

The automobile builders haven't even begun to fight in '55. Why don't they get down to business and make cars that are *really* complicated?

For '56, for instance, they might add built-in hydraulic jacks to hoist the car up so the occupants will not have to crawl in—



operated by push button, of course. They might install a 110-volt storage battery with 55 cells. Or a power booster to help push the starter. There could even be power solenoids to press each push button, operated by electric-eye controls.

C. W. Rickman, Warrensburg, Mo.

Gus Ran a Risk

In your October story about Gus Wilson (p. 170), Gus switched two plug wires, thereby causing backfire to temporarily clear the carburetor jets. Then he switched them back to their proper plugs. How could he do this without getting a terrific shock, since he was grounded through the fender?

Sarkis Dodakian, Worcester, Mass.

Gus was under pretty heavy plot pressure when he did this, remember, but he could

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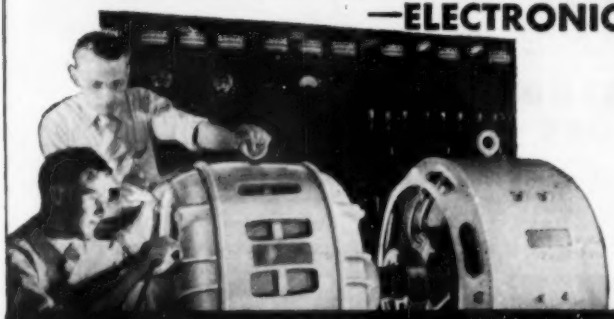

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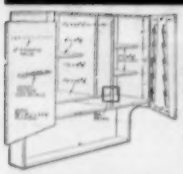

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have done it with those deft and daring fingers of his, if he took care to keep his fingers back from the bare ferrule.

Sick Clock Regains Health

I sure do thank you for the article in the November issue (p. 226) on how to repair electric clocks. Our clock sounded like it

was ready to fly to pieces, but after giving it a treatment according to your prescription, it ran quietly and accurately. It still does.

Your magazine is the best of its kind.

ROBERT E. HENLEY, New Cambria, Mo.

Homemade Midget Car

Here is a photo of a midget car I have built for my children. It is about 7½ feet long, three feet wide, two feet high, and

weighs about 325 pounds. It has a three-horsepower Clinton motor with a centrifugal clutch and travels 20 to 25 miles an hour.

SAMUEL A. MOOREHEAD, Akron

Army's Mechanical Dog

In "Tractor Replaces the Sled Dog" (Dec. '54, p. 87), you state that the vehicle has a four-cylinder Crosley engine. Parts at the front of the vehicle resemble the duct work for air-cooling a one-cylinder engine. Just what engine is used?

JOHN A. ENGLISH, Troy, N.Y.

The Army's official caption clearly states that the engine is a four-cylinder Crosley. We can only assume that the duct leads to the conventional fan and radiator of the Crosley engine.

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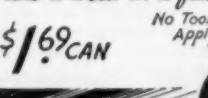

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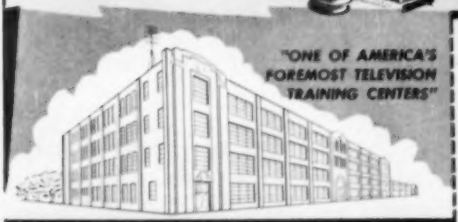

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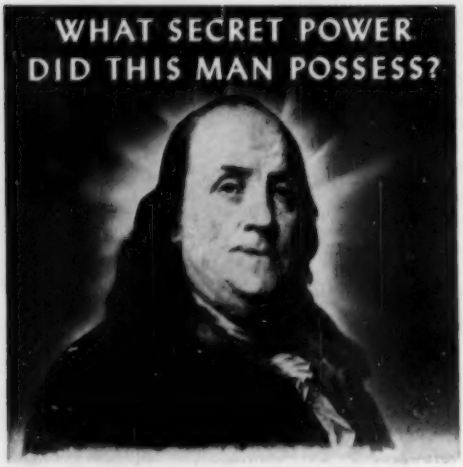

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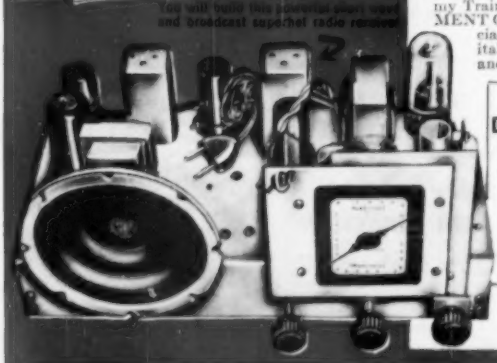

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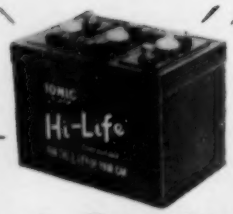

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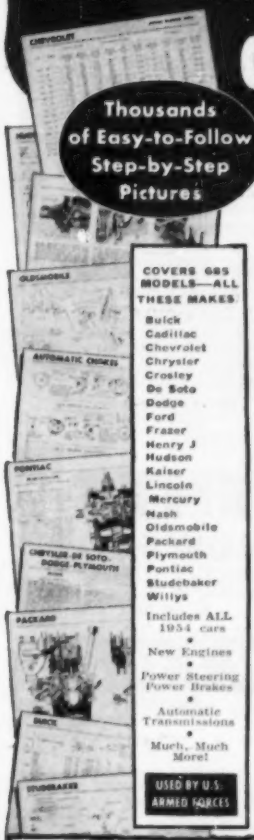

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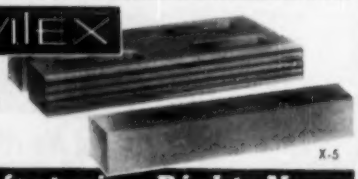

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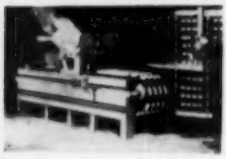

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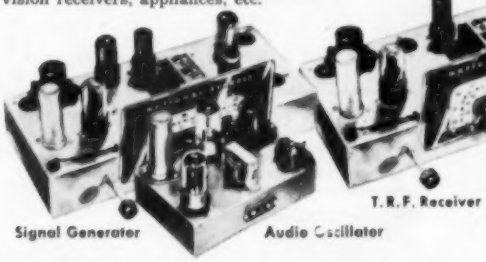

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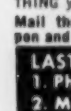

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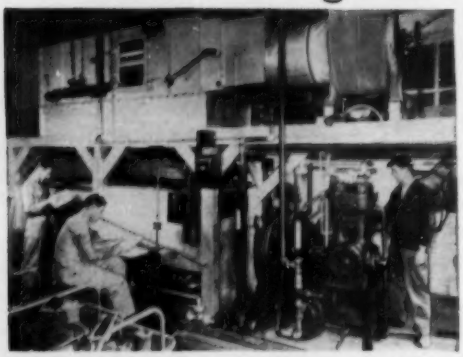

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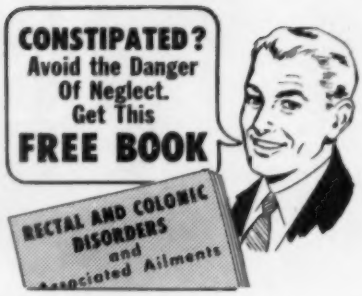

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Many thanks!

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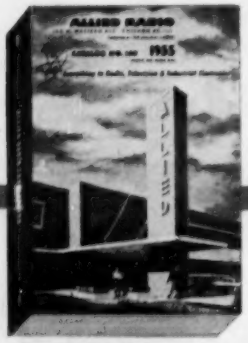

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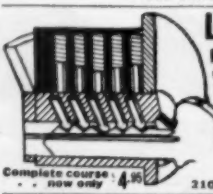

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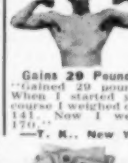

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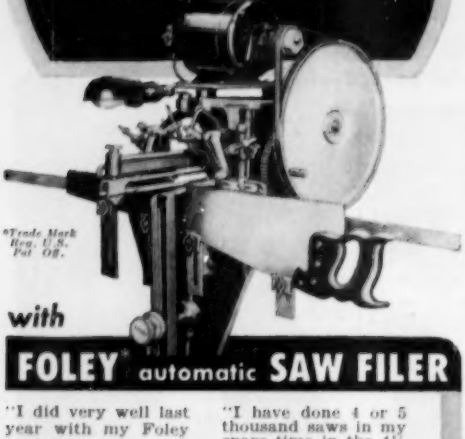

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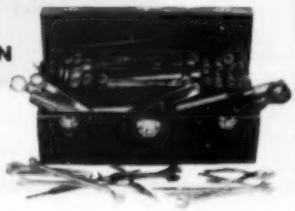

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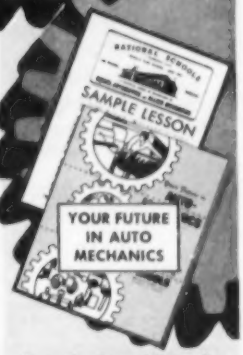

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R Radio
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Today, when demand for trained men is higher than ever before, pay is higher than ever before, you can train AT HOME in your SPARE TIME to become a Television Technician.

L. C. Lane, B.S., M.A.
President, Radio-Television Training Association. Executive Director, Pierce School of Radio & Television.

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You can hold down a full-time job and still train AT HOME by the same successful methods I used to help hundreds of men—many with no more than grammar school training—master television!

NO EXPERIENCE NEEDED . . . I'LL TRAIN YOU AT HOME IN YOUR SPARE TIME

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My School fully approved to train veterans under new Korean G.I. Bill. Write discharge date on coupon.

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Almost from the very start you can earn extra money while learning by repairing radio-TV sets for friends and neighbors. Many of my students earn up to $25 a week . . . pay for their entire training from spare time earnings . . . start their own profitable service business.

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My FM-TV Technician Course can save you months of training if you have previous Armed Forces or civilian radio experience! Train at home with kits of parts, plus equipment to build BIG SCREEN TV RECEIVER. ALL FURNISHED AT NO EXTRA COST!

NEW! PRACTICAL TV CAMERAMAN & STUDIO COURSE

(For men with previous radio & TV training) I train you at home for an exciting big pay job as the man behind the TV camera. Work with TV stars in the TV studios or "on location" at remote pick-ups! Available if you want it . . . one-week course of practical work on TV studio equipment at Pierce School of Radio & TV, our associate resident school in New York City.

OPTIONAL: 2 WEEKS TRAINING IN NEW YORK CITY AT NO EXTRA COST

You get two weeks, 50 hours, of intensive laboratory work on modern electronic equipment at our associate school in New York City — Pierce School of Radio and Television. And I give you this AT NO EXTRA COST whatsoever, after you finish your home study training in the Radio-FM-TV Technician Course and FM-TV Technician Course. However, your home study course is complete even without this two-week laboratory session. It is only one of the many Extras available to you from RTTA if you want it.

C-W Telephone Transmitter

RF Signal Generator

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Super-Het Radio Receiver

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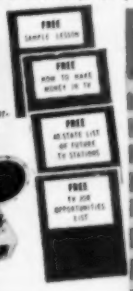

ENOUGH EQUIPMENT TO SET UP YOUR OWN HOME LABORATORY

As part of your training, I give you all the equipment you need to prepare for BETTER PAY TV job. You build and keep a professional GIANT SCREEN TV RECEIVER complete with big picture tube (designed and engineered to take any size up to 21-inch) . . . also a Super-Het Radio Receiver, RF Signal Generator, Combination Voltmeter-Ammeter-Ohmmeter, C-W Telephone Transmitter, Public Address System, AC-DC Power Supply. Everything supplied, including all tubes.

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See for yourself how my simple, practical methods can make success as easy for you as they have for my hundreds of graduates.

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Dear Mr. Lane: Mail me your NEW FREE BOOK, FREE SAMPLE LESSON, and FREE aids that will show me how I can make BIG MONEY IN TELEVISION. I understand I am under no obligation and no salesman will call.

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Here's good news for the man who wants to make an *extra* income in "off hours"! We'll set you up in a proven money-earning business at *no cost to you!* We've helped thousands succeed, and we would like to do it for YOU, too!

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We'll provide a complete Shoe Business Outfit absolutely *free* and *postpaid* . . . so you can run from your home the best "shoe store" business in your town! Use this Outfit to take just **2** orders a day from friends, neighbors, relatives, people where you work. Within a month you'll have **$168** *extra* income! An hour a day should be enough! James Kelly of Ohio took so many orders for these popular shoes that he made $93.55 in just ONE evening! Fred Mape of Utah regularly makes $5 to $10 every hour he devotes to his Mason Shoe business! There's no limit on what you can earn because EVERYBODY wears shoes!

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As soon as we receive the coupon we'll send you a Shoe Business Outfit *FREE!* It features the entire Mason Collection in full color, contains 10-second Air Cushion demonstrator, valuable how-to-make money Booklet, Measuring Board . . . everything else you need to start making cash profits from the first hour! We'll also show you how to earn monthly *Bonus Checks* and win costly prizes FREE!

Want to see how much money *you* can make? For a 2c postcard try it NOW . . . start *your* exciting business *right away!* MASON SHOE MANUFACTURING CO., Desk MA-541, Chippewa Falls, Wisconsin.

Send For FREE OUTFIT!

Mr. Ned Mason, Vice President
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Chippewa Falls, Wisconsin

Yes, I'd like to give myself a $168 a month raise! Please rush my Shoe Business Outfit FREE and postpaid, so I can start making *extra money* from my first hour!

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650x16	5.75	670x15	5.35	700x17	11.95	750x20 10	17.50
650x16 6	7.25	710x15	5.45	750x17	16.45	825x20	21.50
700x16	6.35	760x15	5.95	750x15	10.95	900x20	19.95
750x16 6	8.45	800x15	6.35	30x5	11.25	1000x20	20.45
550x18	4.95	820x15	6.35	600x20	10.95	1100x20	21.25
550x17	4.75	550x15	5.35	650x20	11.75	1000x22	21.95
650x18	5.25	670x16	5.15	32x6 6	11.95	1100x22	22.75
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with Revolutionary New Type

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Permanent All-Metal Oil Filter

ORIGINALLY DEVELOPED FOR THE U.S. GOVERNMENT for use in supersonic aircraft and guided missiles, MICRO BRONZE-type filters are the only filters made that provide *full* lubrication protection for modern automobiles!

ONLY FILTER THAT DESTROYS ENGINE ACIDS

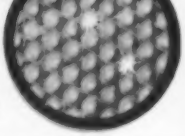
GUARANTEED FOR 99 YEARS

FILTERS THE DIRT BUT NOT THE DETERGENTS

CHANGE OIL ONLY ONCE A YEAR! *Here at last is an oil filter that never needs replacing... increases your engine power... ends monthly oil changes... adds thousands of miles to engine life... stops waste of valuable oil additives... and saves you worthwhile money in the bargain!*

MAGNIFIED PORTION

of MICRO BRONZE filter showing microscopic metal balls fused together to make a solid, but porous, filter. MICRO BRONZE metal can't absorb additives, can't "channel," can't "blow," yet screens out finest particles of grit and metal which drop to bottom of filter housing as "sludge."



THE SECRET IS THE "BRONZE THAT BREATHES"

Millions of tiny bronze balls are fused or "sintered" together to form the astonishing, microscopically-fine filter screen that *never wears out!* Tests in huge gasoline and diesel trucks give conclusive proof that MICRO BRONZE type filters are the finest, most economical oil filtering units ever made.

"FILTERS THE DIRT—BUT NOT THE DETERGENT!"

Major oil companies have developed heavy duty oils containing expensive additives and detergents that greatly reduce engine wear. Old-fashioned cloth, paper or earthen filters—standard equipment on many cars!—soak up these beneficial elements, but by-pass damaging abrasives and metal particles into the engine. The MICRO BRONZE exclusive double-cone design *filters out* abrasives and metal particles as microscopic as 39/millionths of an inch (one micron). Oil additives are *left in* to provide a protective film between moving parts. New MICRO BRONZE Oil Filters, combined with modern HD oils, *double your engine's life!*

Burned gasoline creates a strong sulphuric acid solution that eats into vital engine parts, causing them to wear out years before their time. MICRO BRONZE *is the only filter in the world with a built-in acid neutralizer* which adds years to engine life and eliminates the main reason for frequent oil changing.

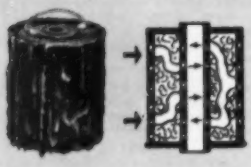
FITS EVERY CAR AND TRUCK

A MICRO BRONZE Unit that fits any standard filter housing costs only $6.95. Easy to install, never needs changing. MICRO BRONZE Filter Housing, including mounting brackets, $9.95.

You'll save the total cost of your MICRO BRONZE Oil Filter in a few weeks. You save in replacement pack costs and "the quart for the pot" you need every time you change filter packs. *Most important, you save costly oil changes—with average driving, one oil change per year is sufficient.*

SOLD UNDER MONEY-BACK GUARANTEE TO LAST FOREVER!

THROW AWAY YOUR OLD FILTER



At left is shown an old-style filter "pack"—the kind that's probably in *your* car now. How can a dirty pack keep oil clean? It can't—actually contaminates your oil! Illustration at right shows how ordinary packs "channel" as a result of oil pressure, allowing dirt to tunnel through the pack and into the oil.

THIS MAY BE WORTH $10,000 OR MORE TO YOU!

If you would like to be one of the people we are appointing as a MICRO BRONZE Distributor or Dealer, write, wire or phone us today. Exclusive territories with profit potentials of thousands of dollars are now being awarded. Address: Sales Division, MICRO BRONZE Filter Corp., 11766 W. Pico Blvd., Los Angeles 64, California

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Ship me immediately _____ MICRO BRONZE Oil Filters with lifetime guarantee as follows. I understand you will promptly refund my money if I'm not pleased.

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No experience or investment needed! We supply everything you need to start earning money from the very first day. Build lifetime security by selling the world's most comfortable, flexible, lightest weight cushion shoe . . . Ortho-Vent "Spring-Step."

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No Wonder 900,000 People Have Taken Up This EASY WAY TO LEARN MUSIC!

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Plays Popular and Classical Music After a Few Months. "I did not know a note of music. Within a few months, I could play many selections, popular as well as classical, to the delight of my friends and relatives. I get much enjoyment in playing for others—not to mention myself. —**Lawrence M. Deno, West Chazy, N.Y.**

Surprises Her Friends. "Not long after I received my course, I had friends come in one afternoon—and did I surprise them when I sat down and played several pieces! They were the most surprised people I had ever seen. I told them about the course and how happy I was with it." —**Mrs. Arvin Rogers, Stamps, Ark.**

Plays Songs After First Month. "After the first month I could play any songs with eighth notes. I have played for a couple of dances, and am now studying Heifetz's 'Hora Stoccata.'" — **Ivan W. Dayley, Lisco, Nebr.**

Does Better Than Friend Who Has Teacher. "My friend who has been taking lessons from a private teacher for the same length of time, is still doing simple exercises—while she would have been playing popular songs like myself had she taken the U. S. School Course instead."—**Miss Marie Van Hulle, Manitoba, Canada.**

Asked to Play in School Band. "Before I enrolled in your course, I didn't know a note of music. Soon I was asked to play the piano for our school's rhythm band. My teacher was so surprised—and congratulated me on how well I could play in such a short time!"—**Patricia McKee, Delphos, Kansas.**

Plays At Dances. "One thing I especially liked about your lessons is that they can be taken in spare time. I did all my lessons at night after supper. I was able to play pieces for my friends and family within a short time. I also had the enjoyment of playing at dances, which is a lot of fun."—**Charles LeRoy Schnell, Birds Eye, Indiana.**

It Actually Makes Learning to Play a *Thrilling Pastime*, Instead of Dull Drudgery!

IMAGINE the thrill of starting to play real music in your very first lesson! IMAGINE the joys of learning music WITHOUT stirring from your own home—WITHOUT the bother and expense of having a private teacher—WITHOUT spending months at boring scales and exercises!

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In just a few weeks, you can be playing REAL MUSIC—even if you don't know a single note now. Not by any "trick" method that merely **seems** to teach you music. But really playing **actual sheet music**—so easily and confidently that friends will suspect you've actually "known how" for years! And the cost is only about a TENTH of what you'd pay a private teacher.

Why not let this famous method bring the pleasures of music into YOUR life? New friends. Extra money from playing or teaching. Greater **listening** pleasure. Possibly a brilliant career. Best of all, the deep **personal** satisfaction of being able to provide your own entertainment.

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Mailing the coupon places you under no obligation whatever—and no salesman will call upon you. You will receive by mail our FREE illustrated book showing how easy it is to learn music this modern way. So mail the coupon AT ONCE. Don't delay putting this wonderful accomplishment into your life. **U. S. SCHOOL OF MUSIC, Studio X-A152, Port Washington, N.Y.** (Special Reduced prices on instruments to our students.)

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650x16(6)	7.35	710x15	4.95	750x17	10.55	825x20	17.55
700x16	5.95	760x15	5.35	750x15	10.45	900x20	17.45
750x16(8)	8.15	800x15	5.75	825x15	10.45	1000x20	17.55
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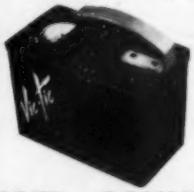

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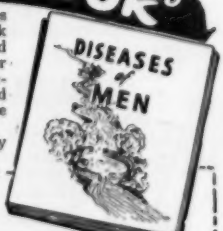

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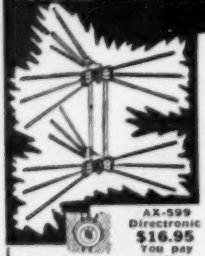

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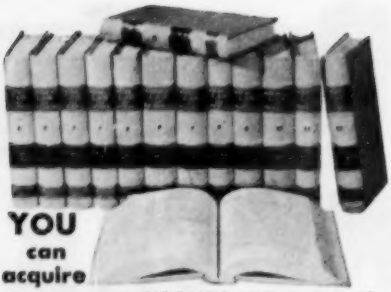

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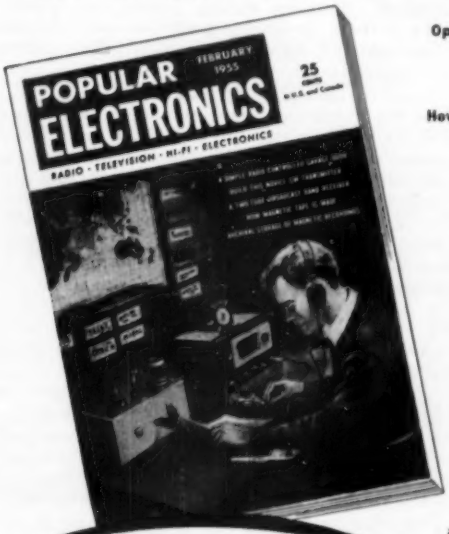

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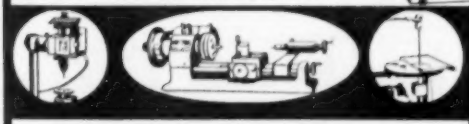

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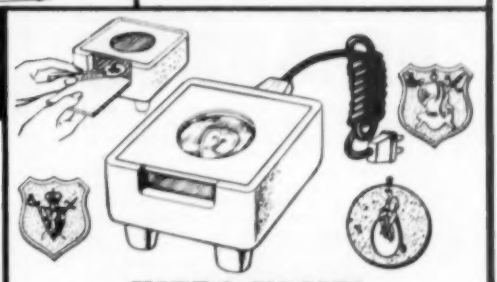

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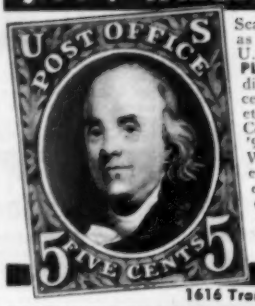

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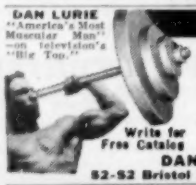

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Start on a SHOESTRING!

The real-life stories of success in Mail Order read like fairy tales. If I had not personally known these people their stories would be hard to believe. Yet they are not only true, but they represent just a few of the hundreds of "little operators" who have been swept into big money by Mail Order.

GAINES. I personally guided his start when he invented an automatic pants presser. He started with one little ad in one magazine. Four years later he retired — with enough real estate to keep him in cash income the rest of his life.

VAN MARK. I worked with him for six years. I met him when he was a wagon man for a tea and coffee house, knocking on doors. He went into Mail Order on nothing—made money from the start —ended up six years later with savings of $50,000 and an income of $5000.00 a year for life without further work.

DUGGAN. A few years ago he was a truck driver. Started fooling with Mail Order in a spare room in his spare time. Last year he said, "I don't know how much I'm worth—after you get the first million you quit keeping track."

MRS. NIXON. Started a small Mail Order business at home—just to keep occupied. It looked good and she came to me for advice. I showed her how to expand. In two years the business got so big her husband resigned his job to help manage it.

FOXMAN. Foxman worked as a hack writer at $70 a week. He had idle time in the evenings—ran an ad offering something he didn't have—got so many orders he had to find a source of supply. He made $18,000 the first year. He gives me credit for "showing the way."

JORGENSON. Consulted me about a specialty product. On my advice he ran one ad to "test" its saleability. That ad brought sales of $50,000. In his first year he did a business of nearly a half million dollars. His original investment was less than a thousand.

These things I have seen. These people I have helped to the realization of their dreams — these and hundreds of others. My own fortune was made in Mail Order. And now my secrets can be yours.

L. W.

Have you ever thought of running a profitable little sideline right from your home? Has it occurred to you that *you are just as capable as anyone else* of making money on a product or service that can be sold by mail? Have you ever looked into the Mail Order business as it's run (on tiny investments) by innumerable small operators?

Forget about Sears and Ward's! *Read about the "little fellows"* . . . clerks, teachers, vets, mechanics, salesmen and others . . . who are packing Mail Order items in bedrooms, spare rooms, attics, garages, cellars . . . dumping them in the Post Office . . . and quietly banking the fistful of Money Orders, cash and checks delivered to them daily by the mailman.

An annual business of almost a billion dollars is done by "little fellows" who advertise and sell *just one item!* The Department of Commerce of the United States says, "A number of the most successful obtain incomes as high as $40,000 to $50,000.00."

It's an incredible story . . . a story of a business that's wide-open for newcomers . . . with opportunities for income far-and-away greater than you can ordinarily hope to attain by holding down a job. And in Mail Order you can stay as small as you wish—run your deal as a $50 or $75 weekly sideline—or consider jacking it up into really big figures as a full time operation.

Glance at the examples at left. *These true stories are far from unusual.* Multiply them by the hundreds and you begin to get an idea of what can be done . . . what *is* being done...in the phenomenal Mail Order field.

* * *

Yet, if you were to jump blindly into Mail Order your chances would be slim. A peculiar brand of "know-how" is vital in this little - known, little - understood business. *This is fortunate for you.* If any Tom, Dick, or Harry would "click" in Mail Order, the field would have been overloaded years ago.

But now you have the opportunity to learn the authentic secrets of successful Mail Order operation. They are revealed for the first time, step by step, in an extraordinary new Survey . . . *the L.W. Confidential Mail Order Letters.*

This Survey is not a course—not a book —not a group of lessons. It is a simple guide that anyone can follow. It shows you how to pick the right product for Mail Order. It shows you exactly how to start a profitable business *fast*, with cash or Money Orders in the envelopes you receive. It shows how to buy your product out of the very money you get in the mail, so you don't have to tie up cash in large supplies of your product. It gives you actual examples of ads and letters, *analyzed to show how and why they make money.* It demonstrates the months to start, the time to expand, the best way to get prospects' names. It reveals from A to Z the confidential facts that have made fortunes for Mail Order operators who use them.

Mail the coupon today, or simply send your name and address on a postcard. No salesman will call. We will mail, postage prepaid, a *Free* copy of "How to Become a Mail Order Millionaire" and along with it will give you complete facts about the L.W. Mail Order Survey. Read the facts. Then decide whether you would like to spend spare time or full time in a profitable, fascinating Mail Order enterprise. If you think you would like to follow the footsteps of hundreds of others who are now making good money in this way, you can get your L.W. Survey and begin at once.

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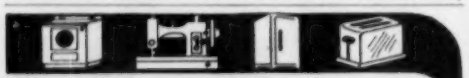

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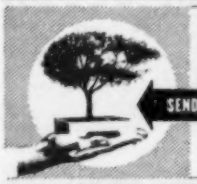

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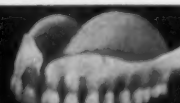

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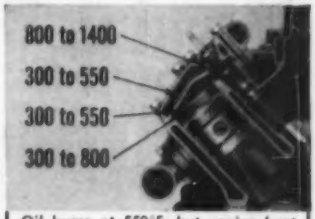

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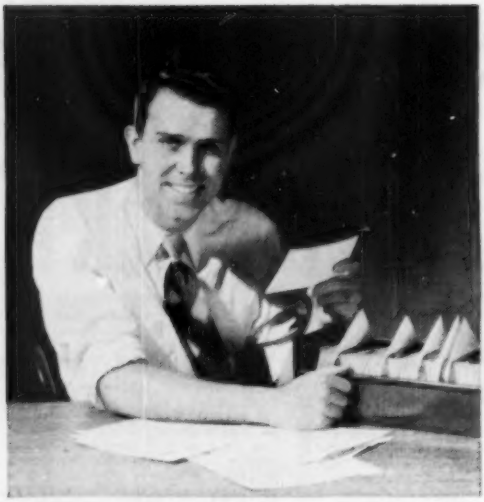

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SAWDUST. Turn it into cash. Twenty methods. Instructions 50c. Charles Company, 12-ECT, Norwood, Ohio.

WOMEN! Make Big Money at home. Sew ties for us. It's fun. Earn $10 day easy. No selling, no experience, no machine necessary. We supply everything. Help us fill huge demand. Exciting details free. Fashion Ties of Calif., P.O. Box 2063, Van Nuys, California.

FREE! "301 Profitable Small Businesses!" Amazing shoestring plans! Work Home! Start Sparetime! Deumant Surveys, Kenmore, 28-T, New York.

LEARN Sewing Machine Repair, electrify, trade sell. How to make Big Money at home sparetime. New zigzag machines, parts, etc. wholesale. Free details. Taylor Service, Hamilton PS-2, Ohio.

MAILORDER—Operate profitable home business using Free Advertising Method. Revealing information free. Seidel, 6000-HG Sunset, Los Angeles 28.

METALIZE Baby Shoes, jewelry, gifts. Bronze, gold, silver. Free bulletin. Kiktavi, 11029-SY South Vermont, Los Angeles 44.

BECOME A Game Warden, or join Forestry Park Lookout, Wildlife Conservation services. Enjoy outdoor work, good pay, real security. Complete information Free! Write "Home-Study Institute," 3156FY West Eighth, Los Angeles 5, Calif.

$1,000 MONTHLY possible in collection agency business. Free details. Write Cole Associates, Syracuse 2, New York.

GROW Orchids at home—profitable—fascinating. Year 'round. Maine to California. No Greenhouse. Gorgeous Cattleyas, Cymbidiums, etc. Successful home grower shows you how. Free—full details. Flowerland, 4622-TV Wilshire, Los Angeles 5.

OPERATE profitable mail order business. Write Walter Service, 4159-B East 112th, Cleveland 5, Ohio.

MEN Wanted—Build Luggage And Cases At Home. We sell your products—supply complete instructions, materials, everything. No special equipment needed. Free details. Casecraft 805-H2 Sunset, Los Angeles 12, Calif.

$25 WEEKLY working two hours daily at home. Lycke, Box 2471-B, Cleveland 12, Ohio.

BRONZE Baby Shoes. Instructions, Equipment and mountings for genuine electroplated process. Free catalog. Hollywood Bronze Supply, Dept. B-1, 1624 East First Street, Los Angeles 33, California.

YOUR envelopes addressed accurately, reasonably. Fast service. We have capable addressers in your city. Glenway System, 5713 Euclid, Cleveland 3, Ohio.

WHOLESALE! 8,000 Nationally Famous Products. 30-80% Discounts! Large Catalog. Sensational Business Plans Included. Consolidated Distributors, 21-15 Lafayette, Paterson 15, New Jersey.

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MINK Raising information free. Complete. Lake Superior Mink Farm, Superior E E5, Wisconsin.

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MAKE extra money. Address, mail postcards. Spare time every week. Write Box 14, Belmont, Mass.

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BE appointed state notary public now. Write—Stationers, Helotes, Texas.

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MAKE Money spare or full time casting Metal Toys and Novelties. Big wholesale and chain store demand for Autos, Soldiers, Ashtrays, Banks, etc., keeps manufacturers busy. Production moulds furnished for up to 100 and more castings per hour. No experience or special place necessary. Write for information and illustrations of patterns needed. Metal Cast Products Co., Dept. E, 1696 Boston Road, New York 60, N. Y.

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I Average $125 weekly selling books by mail! So can you! Start sparetime! Work home! Cooper, 247-T Taunton, Buffalo, N.Y.

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"METALLIZED" Baby shoe mountings, supplies, instructions. Foster, 1520 Ardmore, Chicago.

PRINT for Profit at home. Amazing new method prints colorful posters, banners, greeting cards, glassware—anything. Hundreds at time. No press needed. No art. Fantastic profits! Need representative your area immediately! Free home-business plan. Screen-Print, Dept. J-R, Los Angeles 61, California.

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EXPORT Business made easy! Substantial income, home operated, low overhead, no merchandise buying. Complete setup service. Hermes Exports, 152-R West, 42, New York 36.

MAKE Durable building plastic, easily beautiful, tough—Any color—101 uses—Exclusive district—800% profit. Bays Laboratories 2, Oklahoma City 9.

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NEW Exceptionally Profitable plans. Ideas for home operated mail business. Rush name. Miller, 1881-R Roxbury Road, East Cleveland 12, Ohio.

HAVE Home Mail Business—Get $10 Orders in Every Mail—Keep $8.00. Everything furnished. Hutchinson, Box 87-C, Dorchester 22, Mass.

ELECTROPLATE autoparts, novelties, mirrors, baby shoes. Easy, inexpensive home processes. Free booklet. Tyco Metals, Box 13231-CQ, Houston 19, Texas.

MONTHLY repeat business which you can operate in your own community. For free details write Grassk, 321—28th Street, McKeesport, Pennsylvania.

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$150 WEEK—easy! Start home Venetian Blind Laundry. Revealing book free. AV Co., 101 S. 44th, Philadelphia 4, Penna.

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$70 WEEKLY—home, spare time. Simplified mail bookkeeping. Immediate income—easy! Success revealing information. Auditax, 34651DG, Los Angeles 34.

BE Happy, peppy, slender as myself past 80. New, not sold in stores. Money saver, Money-maker. Postcard. Hartmann, Southold, L.I., N. Y.

WINNING Mail order plans. Merchandise, books. Details free. Mid - State, Box 214-K, Syracuse 1, N. Y.

OPERATE Your own cafe, diner. Little or no capital investment needed. Previous experience unnecessary. Free book discusses how I did it. Restaurant Arts, BU42, Fremont, Ohio.

$5 STARTS Mailorder business. Details. Horton's, 323 Ninth Street, Niagara Falls, New York.

MAKE Perfumes other profitable products Home. "Carelabs", 1914 Chouteau—PS25, St. Louis 3, Missouri.

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INVESTIGATE Earthworm breeding!! Pleasant, profitable home industry! Part; full time! Free revealing facts, information! Write Earthmaster System, 14B, El Monte, California.

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"INCOME Increasers." Opportunities galore in "Timely Tips Magazine." Paulding, Ohio. 30th Year. $2.00. Sample, 25c.

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WANTED! Home Producers, by manufacturers in our Clearing House Service. Become subcontractor, casting plastic products for these companies. Thousands of easy-to-make items required for consumer-industrial use. Cash in at home, without previous experience. Plastic Service Associates, Dept. 2-PS, East Boston 28, Massachusetts.

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UNUSUAL Home mailorder business. Fascinating, clean, profitable. Ready to operate. Angora House, PSM2, Springfield, Illinois.

FAST Selling mailorder item. Three selling plans, circular, sales letters and sample $1.00. Gordon Products, Box 1022A, Syracuse 1, New York.

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MAKE money addressing envelopes sparetime. Glenway, 5713 Euclid, Cleveland 3, Ohio.

WIN contest money. General Contest Bulletin gives hundreds of tips. Lists current contests and rules. Sample 25c. General Contests, 1609-A East 5th, Duluth, Minnesota.

SELL-buy Titania Gems. More brilliant than diamonds. $9.75 carat wholesale. Free Catalogue. Diamonite, 1404-S Mitchell, Oakland 1, California.

START A Buying Service, buy wholesale thousands nationally advertised products. Make big profits selling at sizeable discounts. Postcard brings details. American Buyers', 630-S Linden, Buffalo, N. Y.

WHOLESALE! 8,000 Nationally Famous Products. 30-80% Discounts! Large Catalog. Sensational Business Plans Included. Consolidated Distributors, 21-17 Lafayette, Paterson 15, New Jersey.

EARN Ready Cash doing mailing work—No experience needed—Y. Wilson Business Service, 2875 Glendale Blvd., Los Angeles 39, California.

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MAN Wanted—Are you dissatisfied with your work? Would you like a business of your own? If so, write Rawleigh's, Dept. B-GG-PSC, Freeport, Illinois.

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EARN Money at home! Must have good handwriting. Write for details. Atlas, Box 188-P, Melrose, Mass.

SCHOOL Seniors — Sell Classmates America's most beautiful Graduation Name Cards. Largest selection. Highest commission. Outsells all others. Free sample kit. Printcraft, Dept. P, 1509 Maple Street, Scranton 5, Penna.

NEW 7"x11" Ultra-Blue Signs, 7c, retail 50c. Sample free! Lowy, 812 Broadway, Dept. 843, New York 3.

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FREE! Complete Mailorder Business! Terrific Profits! No Investment! VitaMins, 2908-PSX Beverly Boulevard, Los Angeles 57.

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"HOMEWORKER'S Profitunity Packet" 10c. O'Dell's, 3340H So. 6th St. Road, Springfield, Illinois.

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FREE Folio "Up to $45,000; Unlimited Vacations." No merchandise, equipment. Unknown! Work home—sparetime! Haylings—S16, Carlsbad, Calif.

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NOW You can earn money at home! Over 100 exciting money making opportunities, $1.00. Employment Research, 241A So. LaBrea, Inglewood, Calif.

GROW Mushrooms. Cellar, shed, and outdoors. Spare, full time, year round. We pay $3.50 lb. We paid Babbitt $4,165.00 in few weeks. Free Book. Washington Mushroom Ind., Dept. 179, 2954 Admiral Way, Seattle, Washington.

FREE Book "505 Odd Successful Businesses." Work Home! Expect something Odd! Pacific-35C, Oceanside, Calif.

$200 MONTHLY possible raising earthworms! Backyard, garage, basement. Complete illustrated booklet explains raising, feeding, packing, marketing. 25c postpaid! Ozark Worm Farm-V, Willow Springs, Mo.

WANTED: Typewriter owners. Make handsome profits. Write today. Groves Company, 682 Hastings 3, Nebr.

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ELEVEN Exceptionally profitable mail-order plans. Hamelton, Box 288-MC, Marietta, Ohio.

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OPPORTUNITY Package! Mail dealers propositions, home businesses, sensational offers, 25¢. Steinbergen Press, 1274-K Stebbins, N.Y.C. 59.

MONEY for Christmas bills. Rixse, Sr., Box 243, Falls Church, Virginia.

EXCEPTIONALLY Profitable Home Mailorder Business Plans. Lewis Bartlett, Richland, Georgia.

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MAKE $15,732.00 Fast—$9,504.00 Without Leaving Your Home. $4.37 Profit on every $2.98 sale with re-sales. Free new invention with staggering public acceptance. Everyone write "Research", Dept. PS2, 1024 Cottman Ave., Phila. 11, Pa.

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FORMULAS, 10,000 for $5.00. Authentic, reliable, practical. Brockway, 1145 High, Topeka 2, Kansas.

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FREE Formula Catalog. Anything analyzed $35.00. Western Chemical, Salem, Ore.

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ANY Formula $3.00. Catalog—Mfg. Treatise 10c. J. Belfort, 192 N. Clark, Chicago 1.

TESTED Formulas. Catalog Free. Pont Laboratories, 2625 South Eighth, Terre Haute 1, Indiana.

40 PLASTICS

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PLEXIGLAS, Lucite sq. ft. (12"x12") cost 1/16" $1.14, ⅛" $1.50, 3/16" $1.85, ¼" $2.20. Add 10% for postage. Almac Plastics, 600 Broadway, New York 12, N. Y.

NEW Liquid casting plastic. Clear, colors. Embed flowers, insects, coins. Saw, drill, carve. Send 25c for "How to Cast with Liquid Plastic" and proved Success Plan showing how to make money at home. Castolite, Dept. B-102, Woodstock, Illinois.

PLASTIC Sheets, Rods, Tubes, etc. Free List. Plastic Supply Co., 2901 N. Grand Blvd., St. Louis 7, Mo.

PLEXIGLAS sheets—cut to size—clear, all thicknesses—standard outdoor translucent colors. McClarin Plastics, P.O. Box 168B, Hanover, Pa.

PLEXIGLAS, Lucite. Square foot cost 1/16"—$1.10, 1/8"—$1.45, 3/16"—$1.75, 1/4"—$2.15, 3/8"—$3.28, 1/2"—$4.36. Colors add 10%. Send 15% for postage. Aristocrat Plastics, Inc., 55 Clarkson St., New York City.

PLEXIGLAS, Fiberglas, Polyester, Acetate, Vinylite. Fast service. Wholesale-retail. Catalog—15c. Gem-O'-Lite, Box 5862P, North Hollywood, California.

41 CHEMICALS & APPARATUS

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ILLUSTRATED Catalog: Chemistry, mineralogy, biology 20c. Tracey Laboratories, Evanston, Illinois.

GEIGER Counters, especially designed for college, high school or home laboratory use. Complete with manual of experiments —$139.95. Atomic Laboratories, Box 343, Berkeley, California.

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EXPERIMENTERS Supplies catalog: 10c. Hagenow Laboratories, 2414 Clarks, Manitowoc, Wisconsin.

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42 HELP WANTED

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MAKE extra money. Address, mail postcards. Spare time every week. Write Box 14, Belmont, Mass.

FREE Information available about Foreign & U.S.A. job opportunities paying to $1,000 monthly. Write immediately. Dept. 76D, National Employment Info. Serv., 1020 Broad, Newark, New Jersey.

OVERSEAS, Latin American, Alaska, Canada Employment. Originator 1955 "Foreign Service Directory" Up-To-Minute Report on Military & Civilian Construction; Oil Companies; Aviation; Transportation; Steamship; Mining; Government Job Info. How-When-Where to apply. Listing Firms Hiring. $1.00. Global Reports, Box 883-S, Hollywood 28, Calif.

SEND Postcard for Free Money-Making Kit guaranteed direct-from-Mill nylons, lingerie, blouses, men's and children's wear. American Mills, Dept. 448, Indianapolis.

SAN Francisco help wanted columns airmailed $1.00. Hubbard, Box 1442, Palo Alto, California.

OVERSEAS Jobs. Many firms hiring Truck Drivers, laborers, Clerks, Mechanics, Carpenters, Pipe Fitters, Electricians, Plasterers and other trades. Pay to $1,500.00 monthly. Transportation paid to and from jobsite. Jobs open in USA, Spain, South America, Alaska, Canada, St. Lawrence project and others. Full information of all Contractors with name and address, wage rate both USA and Foreign, hours, living conditions, how to apply for job with application blank mailed to you same day order received for $1.00. Airmail $1.25. Satisfaction guaranteed or money back. Overseas, Box 2274, Dept. 6, Dallas 21, Texas.

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FOREIGN Employment. Construction Work. If interested in foreign projects with high pay, write Foreign Service Bureau, (Dept. P.S.), Metuchen, New Jersey.

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POPULAR SCIENCE OPPORTUNITIES

SEATTLE Help wanted columns airmailed, $1.00. Box 351, Connell, Wash.

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FREE Information. Construction projects require all trades, Ellis, PS-2, Box 207, Westmount, Quebec.

BOSTON Help wanted column airmailed $1.00. P. O. Box 206, Cochituate, Mass.

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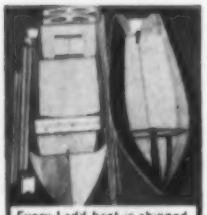

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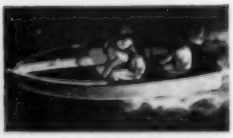

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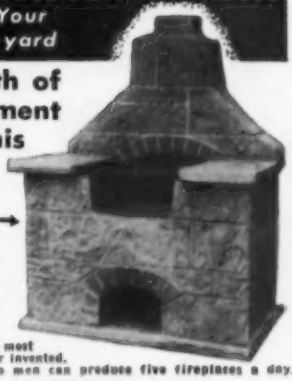

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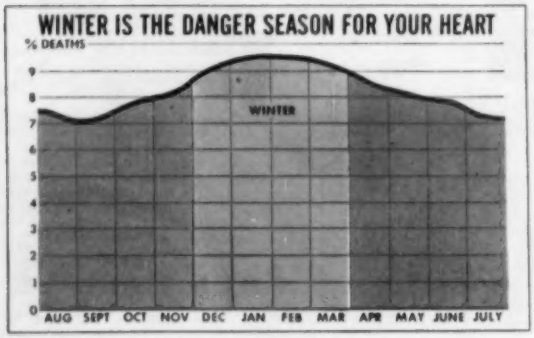
POPULAR SCIENCE MONTHLY'S • • • **Last-minute news & notes**

SOME NEW CARS WILL COST LESS for customers living in California and other places distant from Detroit. The saving is a "readjustment" in the freight charges added to the f.o.b. price. These charges are often not actual freight cost anyway, since many new cars are assembled and shipped by local plants instead of Detroit..."THERE IS NO REAL ADVANTAGE IN WARMING UP THE MOTOR," says P.N. Ku of the U.S. Bureau of Standards. As long as the car has oil, the engine will force it to the bearings, cold or hot. At least one car maker agrees. Says the Plymouth manual: "It is not necessary to wait until the engine warms up." ...A NEW MECHANICAL COP blows a siren at you if you speed through a school zone. It lets loose automatically whenever a passing car exceeds the set limit. Made by Zonealarm Corp., 712 E. 163 St., Cleveland 10.

A SCIENTIST WHO PLAYS THE PONIES bases his system on operations research, statistical techniques developed during the war. Dr. Herbert Ruderfer gets his original data from the same source used by less learned gamblers--the daily racing form...MOLES WITH RADIOACTIVE BRACELETS CLIPPED TO THEIR TAILS are revealing their underground movements to a British scientist, Mrs. Gillian Crowcroft. She follows the moles with the help of a standard radiation detector on the end of a fishing rod...WHO INVENTED ATOMIC ENERGY? The French have put in a claim for royalties, citing patent applications filed in 1939...GOOD WEATHER FORECASTS 60 DAYS AHEAD could be made on the Navy's new electronic brain, NORC, the world's biggest and fastest. The job would take the machine 24 hours.



EASY WITH THAT SNOW SHOVEL--heart attacks kill more people in January and February than in any other months (see chart). The reason is unknown. ...TRUE IMITATION RUBBER has been made by Goodrich-Gulf chemists. It is identical with natural tree rubber; ordinary synthetic rubber is not.

CULTIVATE
MOW WEEDS
SAW TIMBER, FIREWOOD
MOW LAWNS
BLOW SNOW
MOW LAWNS, WEEDS, MULCH LEAVES
HAUL
GRAVELY
More for your Money!
GRAVELY MAKES TOUGH JOBS EASY!
Gravely does jobs other tractors won't . . . because Gravely has that extra power you need for the tougher mowing, gardening, field and farm jobs. Does a better job, even on steep slopes!
You get more when you get Gravely. All-gear drive, power reverse, simple operation. More traction from easy-handled, balanced weight. Power attachments quickly interchanged, securely mounted, with only four bolts!
See Gravely's rugged, compact, completely functional design. Not merely assembled, but completely manufactured by specialists who make only Gravely Tractors and their attachments.
5-HP
SINCE 1922
(Dealership opportunity in some areas.)
PLUS . . . 21 JOB-RIGHT TOOLS!
Your choice of 21 tools for a versatile tractor that saves time, work and worry all year long. Tools to do every mowing, gardening, field and farm job.
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Send coupon today for "Power vs. Drudgery", the big booklet that shows how Gravely equipment solves your upkeep and gardening problems . . . faster, easier, better! Ask about NEW EASY PAY PLAN.
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GRAVELY TRACTORS, INC.
BOX 284 DUNBAR, W. VA.
Please send me "Power vs. Drudgery" Booklet and dealer's name.
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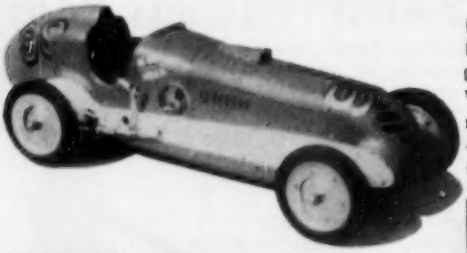
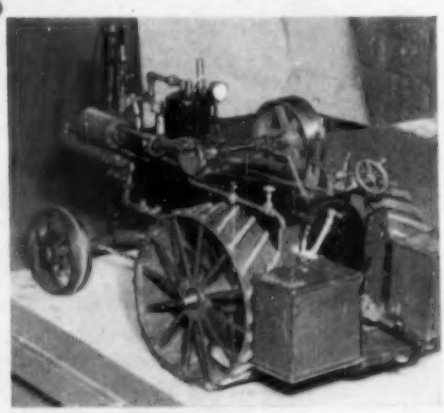
CRAFTSMEN AT WORK

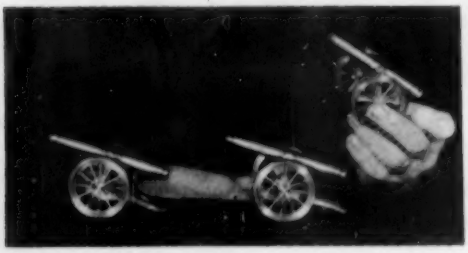
Model Logs 1,000 Flights. Only one minor landing crack-up in 1,000 flights over a period of 10 years is the record of this scale Piper Cruiser built by Howard Yonkers, San Mateo, Calif., a member of the Peninsula Prop Twisters. The Piper has a 7′ span and is powered by a 15-year-old Class D OK Twin.



Midget Racer Does 100 M.P.H. For 14 years G. Evans Codding has been setting records here and abroad with model racing cars that are as mechanically perfect as they are realistic. The five-pound Indianapolis free-lancer shown here has a magnesium body and cast-aluminum chassis. It is fully sprung, equipped with shocks, working brake, and front-wheel drive. Engine is a 10-cc. one-lunger, converted to semi-diesel. Souped up with twin carburetors and dual rotary intake ports, it develops ⅘ hp. at 10,000 r.p.m. and a speed of 100 m.p.h.

Model Steam Engine Was Built from Memory. The 1″ scale model of a steam traction engine below was built by Ralph W. Green, Elizabeth, N. J. It is a copy, mostly from memory, of one he operated 40 years ago to pull a thresher in the Midwest. He's now working on a 2″ model.





Tiny Cannons Made of Brass. A. L. Bent of Granville Ferry, Nova Scotia, who keeps a file of POPULAR SCIENCE MONTHLY, went back to the January, 1947, issue for plans for making the model brass cannons you see at the left. First fashioning his own lathe attachments to make the work easier, he has made 12 of the little cannons from PSM plans and at last report was on his 13th.

Beyond the sound barrier... *to a new world of quiet!*

Something New . . . something wonderful has happened to outboard boating!

Gone is the barrier of jangling sound that stood between you and complete enjoyment of the water!

Gone are the strident engine noises—the raucous "lows"—the shrill "highs"—throughout the full range of objectionable sound frequencies. We've tuned them out . . . or sealed them in . . . muffled them . . . canceled them! *At all speeds*—slow, medium, top! We've left you nothing to *hear* but the swish of the bow wave beneath the motor's pleasant purr.

Gone, too, is nerve wracking vibration. Gone is the arm-tiring tingle of the steering handle. Gone is all "engine shake" from the hull . . . completely isolated from boat and passengers by the all-direction cushioning of Aquasonic mountings. We've left you nothing to *feel* but the boundless surge of power that is utterly smooth!

Here is your future in boating fun . . . *Whispering Power*, smooth as sailing! It's yours to enjoy in any size boat, small family runabout to cruiser. See your Evinrude dealer—look for his name under "Outboard Motors" in the yellow pages of your phone book. Choose from a complete range of Aquasonic models, 7½ to 25* horsepower. Time payments available. For free full-color catalog of the 1955 Evinrude line, write **EVINRUDE MOTORS,** 4545 N. 27th Street, Milwaukee 16, Wisconsin.

Write for Free Catalog

Big full-color catalog describes complete line of Evinrude models for 1955. Priced as low as $145 for the Lightwin with famed Fisherman Drive. Send for your copy today!

big twin *Aquasonic* with electric starting

Last word in fine outboard performance! Big Twin's 25 thrilling horsepower, now velvet smooth and whisper quiet. *Plus* finger-touch starting . . . electric starting that you *know* is right . . . tested and proved in millions of miles of owner service. **$525**

Standard Big Twin Aquasonic . . . $430

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Evinrude quiet *Outboard Motors*

A DIVISION OF OUTBOARD, MARINE & MANUFACTURING COMPANY

In Canada: Manufactured by Evinrude Motors, Peterborough

1955 MERCURY

Features the World's Most Modern Spark Plugs . . .

NEW TURBO-ACTION CHAMPIONS!

Greater clearance in the firing end permits turbulent gases to keep the insulator free of harmful deposits. Heat range, the temperature zone in which spark plugs operate efficiently, is extended to the widest limits in automotive history.

Exclusive, tapered Turbo-Action seating design forms a positive lock with a mating surface in the cylinder head without use of a gasket. Correct installation is automatic and Turbo-Action spark plugs remain firmly fixed and accurately positioned in the combustion chamber.

More evidence that the new TURBO-ACTION Champions are the spark plugs in your future:

Another producer of great motorcars—Mercury—now features these sensational new spark plugs as standard equipment on its power-packed 1955 models!

Champion TURBO-ACTIONS—with the widest operating range in automotive history—allow you to enjoy to the fullest extent the benefits of sharply increased compression ratios and horsepower of advanced-design power plants. And they supply the entire automobile industry with a key to increased efficiency for engines of the future.

The TURBO-ACTION principle involves a larger thread size and an exclusive seating arrangement without gaskets. Thus, these new Champions can be installed only in ultra-modern engines designed to use them.

Your present car will continue to give you peak performance with regular Champions.

With the new TURBO-ACTION Spark Plug, Champion once again demonstrates the leadership which makes Champions the first choice of motorists everywhere.

AT ALL LINCOLN, MERCURY AND OTHER CHAMPION DEALERS

CHAMPION SPARK PLUG COMPANY, TOLEDO 1, OHIO

New Paints Give You Pro's Skill

Vinyl? Acrylic? Alkyd? Odorless? Here is the lowdown on which can do what.

By George H. Waltz Jr.

Neutral paint plus color from tubes gives the shade you want with many new paints, such as Sapolin's (above).

PAINTING your house will be easier than ever this spring—if you get the right paint. But it's going to be harder than ever to pick out the right stuff.

Back when you helped your father redo the family homestead, paint was paint. One kind looked, smelled, was applied and eventually dried much like another. Things are different now. Besides father's oil paints and the postwar rubber-latex paints, you have to choose from a new set of concoctions. It'll pay you to know about them.

There are water paints you can use outside. (You clean your brushes under the faucet and use the garden hose to get spatters off the shrubbery.)

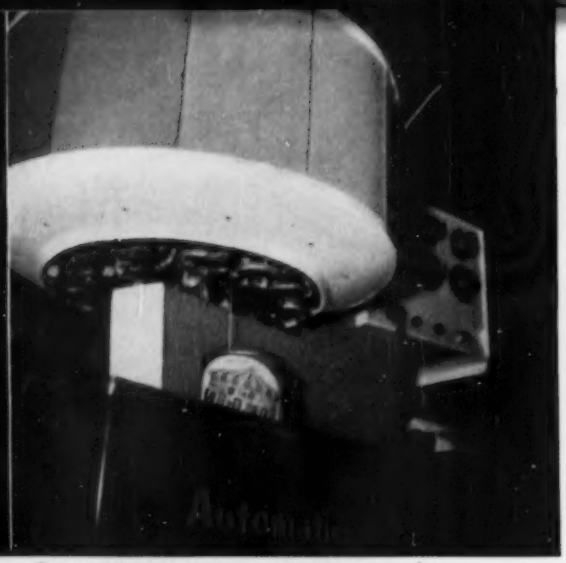
There are finishes so tough they withstand even attacks from the *neighbors'* kids.

There are paints that dry so fast you start the second coat as soon as you finish putting on the first.

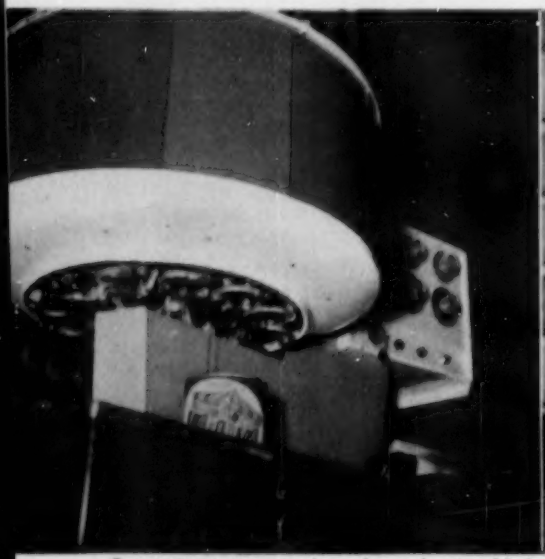
There are colors in glittering confusion, a rainbow-plus to delight the semipro decorator you married—and maybe even match her favorite drapes.

No single product can do all these things. There are several types, all available under a variety

1 DIAL THE COLOR and machine does the rest. With the Color Carousel, clerk mixes paint to order simply by setting dials to code corresponding to color chip customer has picked out.



2 COLOR CONCENTRATE SQUIRTS OUT from battery of tanks in drum at top of Carousel. Tank is positioned automatically by setting of dials. New model will create 6,000 shades.



3 ANOTHER SQUIRT of another color is added to the can of paint. Amount of color is controlled by dials and by height of can, which trips buttons to signal pint, quart or gallon.

4 PERFECT MATCH is shown by test strip after can is shaken on vibrator (background). Color Carousel is made by Standard-Toch Chemicals, Staten Island, N.Y., for its paints.

of trade names. The trade names are, to put it kindly, confusing. For example, two brands of the new paints use "rubber" in their trade names, yet neither is a rubber-latex paint and each is actually an entirely different type of paint from the other. To get the right stuff you have to read the fine print on the label and find out what is actually inside the can.

Vinyl is a cousin to the tough plastic used for upholstery and floor tiles, but this stuff comes thinned with water ready

HERE'S THE SCORE ON THE NEW PAINTS	EMULSION FINISHES				SOLVENT FINISHES	
	Rubber	Vinyl	Rubber-Vinyl	Acrylic	Alkyd	Oil
EXTERIOR	No	Most	No	Some	No	Most
INTERIOR	Yes	Some	Yes	Most	Yes	Some
THIN WITH	Water	Water (Unless can label specifies specialreducer)	Water	Water	Mineral spirits, turpentine or odorless solvent if paint is odorless type	Mineral spirits, turpentine or odorless solvent if paint is odorless type
CLEAN UP WITH	Water	Water	Water	Water	Mineral spirits, turpentine or odorless solvent	Mineral spirits, turpentine or odorless solvent
DRYING TIME (Time between coats)	3 - 4 Hours	2 Hours	2 Hours	1 - 2 Hours	Overnight	Exterior: 2 - 3 Days Interior: 8 Hours

for you to brush, roll or spray on. The label on the can may say vinyl, vinyl emulsion, polyvinyl acetate or PVA.

You can use vinyl on almost any exterior except previously painted wood. It works fine on wood shingles and shakes, asbestos shingles, brick, stucco, concrete and masonry blocks. One manufacturer, Devoe & Raynolds, says you can even put it on wood clapboard if the clapboard is new and unprimed.

The big thing about vinyl is the thinner—water. You get all the advantages of easy cleanup that have made interior water paints so popular.

Suppose it rains while you're working? Vinyl paint dries fast—as quickly as 10 to 30 minutes—and will withstand a shower after that time. It takes another 12 hours to "cure," by then forming an exceptionally tough, long-lasting film that stands up well against weather, sun, salt air and factory smoke.

One precaution: You can't paint with it in cold weather. The chemical reaction that transforms the water solution into a durable finish will not take place if the temperature is below 50°. (Conventional oil paints don't stick well in cold weather, either.)

Some manufacturers recommend their vinyl paints for interior as well as exterior use; others say no, not so good. One company expects to market soon a vinyl made specifically for interiors.

Definitely good inside the house is a new vinyl primer-sealer (Du Pont) to be used as a base coat under any paint. It dries in as little as 30 minutes. You can put it around a room and probably follow immediately with the finish coat. It can be applied with brush or roller.

Acrylic is the second new name for magic in paints. This is also a plastic-in-water (the solid stuff you know as the beautiful, glasslike Plexiglas and Lucite).

Inside the house is where acrylic shines. It dries faster than other types, and it keeps its color better, without yellowing. Says one major producer: "It combines more of the qualities demanded by both amateur and master painter than any flat wall finish ever tested in our laboratory." One disadvantage: It costs more.

Some acrylics are also recommended for exteriors (over the same kinds of materials as vinyl paints). Here it has a big edge—you don't have to pick your painting weather so carefully. It can be

HOW 90 EQUALS 572. Du Pont chemist Charlie Shay poses with the 90 small color tubes (in front of him) that can create the 572 different colors in paint cans arrayed behind him. The paint comes in neutral shade; you (or the paint dealer) add one or more color tubes to tint it. This gives wide color range, also permits various base paints—alkyd gloss, semigloss and flat, even rubber-latex—to be color-matched.

applied on humid days and in cold seasons, so long as the temperature is a few degrees above freezing.

Alkyd is an old interior paint made newly popular by a change in solvent—a super-refined petroleum chemical that has almost no odor. It is not a water paint. You thin it and clean brushes with turps, or, if you want to retain the odorless feature, with the new odorless solvent. (Ask the paint-store man for just that, odorless solvent.)

Alkyd has solid claims to fame overriding the slight cleanup inconvenience. It is exceptionally tough and very resistant to scrubbing. It stands up well in the trouble spots—trim, bathroom, kitchen. And it is easy to apply, producing a smooth, even finish free of streaks and brush marks.

The alkyds have little odor, but don't forget that the solvent is a petroleum product and its vapor is there even if you can't smell it. It can make you sick and it burns very easily, like the vapor of older paint solvents. So play safe: Keep windows open and keep flames away.

The old reliables are not to be overlooked either. Conventional oil paints can now be had in a deodorized version, made with the same low-smell solvent used in the alkyds. And oil paint has much in its favor: It is sold everywhere; its virtues and faults are well established through centuries of use; it makes a tough film on almost any surface; it offers the greatest color range; and it is often cheaper.

Water-thinned rubber-latex paint is already an old reliable, though it is only about 10 years old. It accounts for a big percentage of all paint sold and is still the most widely available of the easy-to-use finishes. One new type is a combination vinyl-rubber paint (Sapolin) that is said to do a better job on interiors than either vinyl or rubber alone. It dries faster, lasts longer and has less sheen, says Sapolin.

Color. The paint makers are out to sell your wife, and color is their gimmick. They are tempting her with a kaleidoscope's variety—by year's end one firm will offer more than 6,000 different shades.

Practically every manufacturer has a "color system," a fat book of color chips with instructions for duplicating each chip. This is accomplished by intermixing cans of colored paint, by adding a concentrated color to a can of colored paint, or by adding concentrated color or colors to a can of neutral "base" paint. And for those who don't want any guesswork there's the Color Carousel (shown in the photos on page 100) that mixes the paints right in the store. Whatever the method, the result is a range of colors such as no amateur painter has seen.

So get out your painter's hat and limber up your roller arm. A good paint job is easier than ever. END

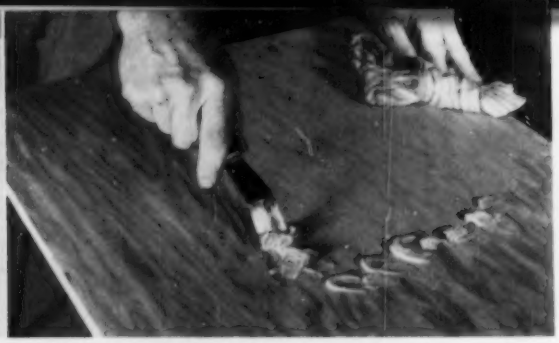
Brighten Up Your Home

Colors Give Fir Plywood Costly Look

FIR plywood costs half as much as fancier types and is stocked by lumberyards everywhere. That's what makes it so appealing for paneling, built-ins and furniture.

But its garish grain pattern has given it a bad reputation. Impossible to finish attractively, you'll say. You couldn't be more wrong. There are new materials and techniques that let you use this cheap

WHAT RESIN SEALER DOES to fir plywood is vividly shown above. The bottom half of the panel was not sealed, and the grain glares through the stain. The upper—sealed—half shows a subdued, attractive grain pattern.



JEWEL-TONE STAIN requires a special sealer made just for use with it. The sealer is thinned, brushed on and allowed to set for 10 minutes. Then it is scraped off (above) and the wood is wiped clean with a cloth.

FOR SPATTER FINISH you fleck painted plywood with drops of paint from a brush or Flit gun. Hitting the brush with the stick, as above, will give comparatively large drops. Use drops of several colors for best results.

FINER SPATTER is created by hitting stick with brush (above), or by thinning paint. Fine spatter here was put on top of large drops, for variety. This finish, now popular for almost everything, gives attractive "depth" effect.

plywood and get colorful, rich results.

You can paint it a couple of different ways. You can stain it with wax, glaze, oil, or jewel tone to achieve not only the familiar furniture shades but also new and striking color effects. You can even dye it any shade in the rainbow.

There are two tricks to quieting the noisy grain. One is obvious: plenty of fine sandpaper and plenty of elbow grease. Sand often but gently. Even a new, seemingly smooth sheet of plywood needs a going-over. Always finish with light, *wet* sanding. The other trick is resin sealer, required under most but not all finishes. The clear sealer greatly subdues the grain. The pigmented sealer can hide it completely.

Paint—applied the right way—will cover up fir plywood's grain to make a smooth finish that gives no hint of the inexpensive wood underneath.

For a solid color, put on resin sealer with sprayer, brush or rag. After a few minutes, use a cloth to wipe off any that is not absorbed. Let dry at least six hours and sand lightly with 6/0 sandpaper. Then give it two coats of enamel.

Parchment is a restrained two-tone finish that is especially effective on fir plywood. You start with a good plain paint job. Then you need a slightly darker hue of the same color paint—you can simply add a little black to the paint you used for the first coat. Thin it with turpentine and linseed oil, then flow it freely over the painted surface, spreading it with a rag. Get the streaked effect

PAINT BOMB provides a convenient push-button way to get a smooth paint coat on small plywood areas, such as table tops. Bombs come in many colors, but are expensive if big areas —wall paneling, for instance—must be covered.

PARCHMENT EFFECT is achieved by wiping the partly dried second coat of paint. This coat should be a shade darker than first coat. Pattern of straight streaks was used here, but any dappled or stippled design can be made.

you like by wiping, dappling or stippling with a clean rumpled rag.

Spatter is an old colonial style resurrected by ultramodern decorators because it is so practical—you never see dirt or scratches on it. You start again with a plain paint job, then fleck the surface with paint dots of different sizes and colors. You can do this with a Flit gun or by tapping a paintbrush on a stick. Either way, you can vary the effect by how much you thin the paint; thicker paint gives bigger drops.

For the best results, spatter with at least three different colors. Since you need comparatively little paint, this is a fine way to use up leftovers from other jobs.

Stain wax gives you a beautiful natural finish with just one coat—no sealer. You simply wipe or brush it on, rub it in after a few minutes. It will dry to a pleasant waxy glow. The off-beat colors—blue, gray, ivory or white—give better results on fir than the conventional wood shades.

Stain glazes provide another easy way to get a wide variety of lovely colors that show off the wood grain to advantage.

For a blond stain glaze, use white-pigmented resin sealer. Put it on with a big brush and don't worry about how evenly you do it. After it has had a few minutes to begin to dry, wipe the plywood gently with a soft folded cloth. How soon and how vigorously you do this will determine the degree of blonding. You can wipe so that the unwanted dark grain is masked.

For a color stain glaze, you can use ready-mixed resin sealer available in several muted shades that look particularly good over fir plywood. Or you can

What to ask for:

It's the rare paint dealer who knows what you want when you order jewel-tone stain. Here are trade names and manufacturers of special products that were used to get some of the finishes described in this article.

Resin sealer: (clear, white-pigmented and colors): Rez (Monsanto Chemical Co., St. Louis 4); Firzite (U.S. Plywood Corp., 55 W. 44 St., NYC).

Stain wax: Cabot's Stain Wax (Samuel Cabot, Inc., 141 Milk St., Boston 9).

Jewel tones: Color Grain (Adelphi Paint and Color Works, Ozone Park 17, N. Y.).

Crystal-clear varnish: Crystal Spar Varnish (Adelphi Paint and Color Works, Ozone Park 17, N. Y.).

Sandpaper: Wetordry sandpaper (Minnesota Mining & Mfg. Co., St. Paul 6, Minn.).

UPGRADING FIR PLYWOOD WITH COLOR

FINISH	SEALER COAT	MAIN COAT	SECOND COAT	PROTECTIVE COAT
PAINT	White-pigmented resin sealer	Brush or spray on paint or enamel	Same as main coat	None
SPATTER	White-pigmented resin sealer	Brush or spray on paint or enamel	Spatter on contrasting colors	None
PARCHMENT	White-pigmented resin sealer	Brush or spray on paint or enamel	Apply second color; wipe with cloth	Clear varnish (optional)
STAIN WAX	Clear resin sealer under dark wood colors only	Apply with brush or cloth; wipe after 10 minutes	None	Stain wax, natural (optional)
STAIN GLAZE	Clear resin sealer under dark wood colors only	Apply with brush or cloth; wipe if lighter effect is wanted	None, unless darker tone is wanted	Varnish, wax, white shellac or clear lacquer
OIL STAIN	Clear resin sealer	Apply with brush or cloth; wipe if lighter effect is wanted	None	Varnish, wax, white shellac or clear lacquer
JEWEL TONES	Special undercoater made for this product	Apply generously with cloth or brush; wipe in straight lines	None	Crystal-clear varnish
DYE	None	Dissolve dye in warm water; apply with brush or cloth	Seal with white shellac; sand lightly	Lacquer, shellac or flat varnish

mix your own colors by adding ordinary color-in-oil to the white-pigmented resin sealer. Either kind should be applied over a first coat of clear resin sealer.

Jewel tones let you put real drama on paneling or furniture. These come in brilliant colors—bright blue, red, green, purple and a glossy black. The first coat should be the sealer made especially for this product. Then apply the color generously, wait a few minutes and polish with a cloth.

Oil stains, the old reliables of wood finishing, can be used successfully on fir plywood despite the atrocious results you have probably seen all too often. The trick is resin sealer. Use the clear type, sanding after it is dry. Then stain in the conventional way.

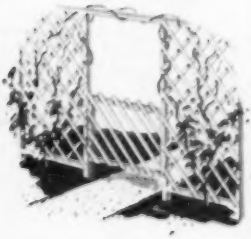
Dyes—the ordinary fabric kind your wife buys in the dime store to change the color of her draperies—work fine on wood and come in hundreds of shades. Dissolve the dye according to instructions on the box, but vary the amount of water to get the depth of color you like. Then wipe or brush on the unsealed wood. You'll have to sand carefully after it is dry to level the grain raised by the water.

Top coats. Paint finishes are tough enough to take normal wear without any additional protection, although you may want to cover the parchment finish with a clear varnish. The grain-revealing finishes will probably need surface coats, particularly when used in areas subject to hard wear—furniture, doors or playroom paneling.

Wax, shellac, varnish and lacquer are all good, varnish being the toughest and lacquer changing the color least. (Remember that you cannot lacquer over paint!) Whatever you use, you will get the best-looking finish by applying two or more thin coats. END

Brighten Up Your Home

Trellises Add Color the Easy Way



SOME of the prettiest flowers that bloom in the spring need supports to grow on. And the supports themselves can be an asset to any house.

You can make trellises shorten a tall house or heighten a low one, vary a monotonous wall, screen a window, shade the hot sun or hide the garbage cans. If

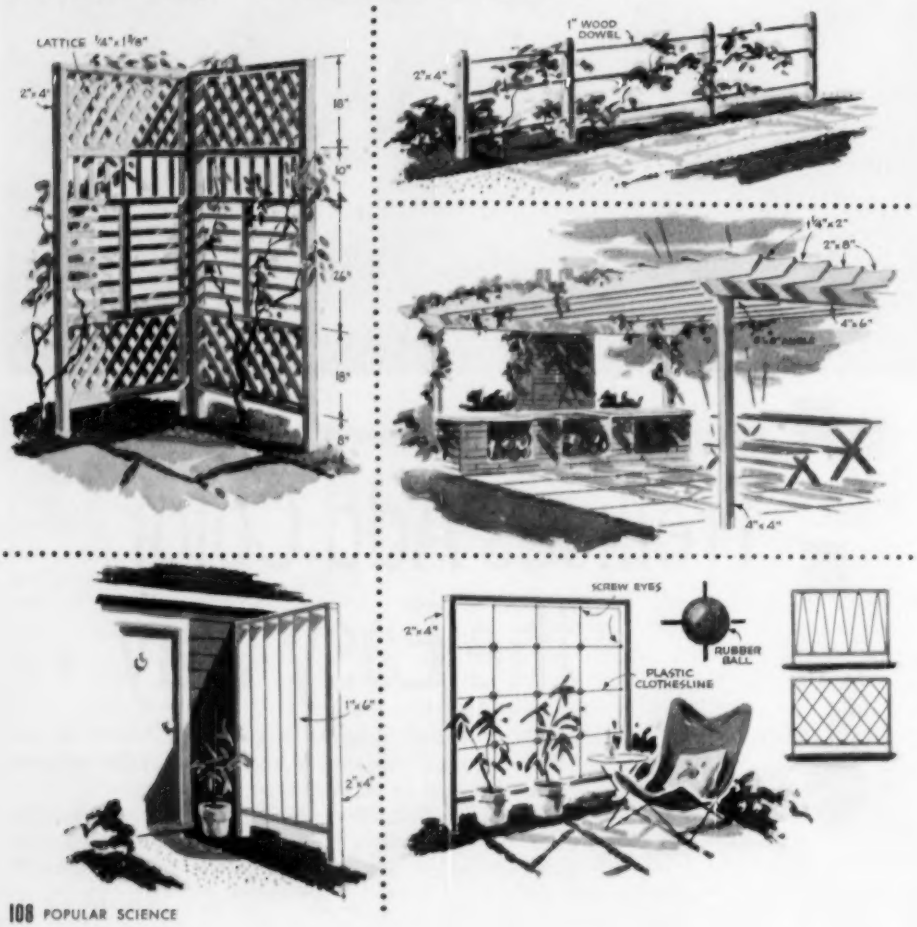
you are the proud possessor of a shiny new house in a shiny new development, you will find trellises the fastest, easiest and cheapest solution to many a common annoyance. That development look? A couple of trellises will set off your home from its neighbors. No privacy? The right vines on trellises block sight but not light. No shade? A cheap arbor trellis is a quick substitute for a tree, its slats cutting much hot sun even before the vines grow up.

Simple trellises are easy enough for a boy to build. You can use inexpensive wood, but treat it with preservative (PSM, May '54, p. 180). Nonrusting nails and screws (aluminum, brass or stainless steel) are best.

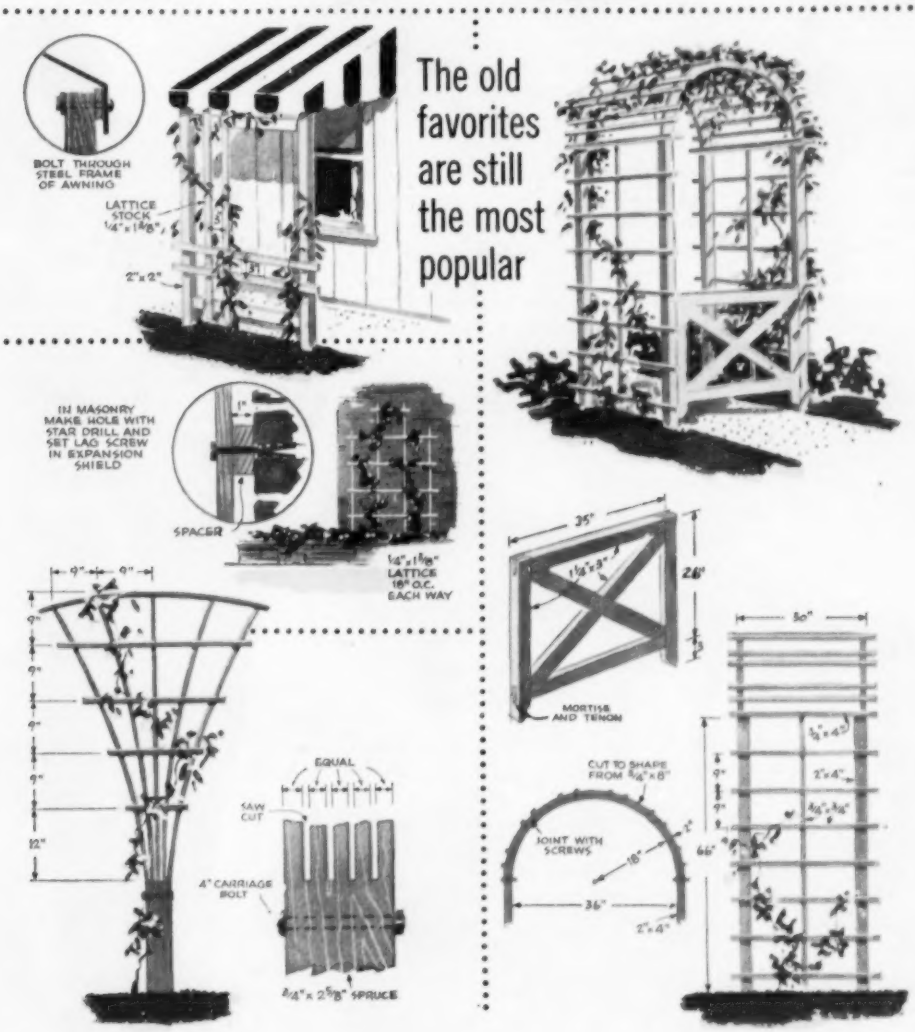
It is often convenient to hang light, on-the-house trellises with hooks or storm-sash hardware instead of nailing them on permanently. Makes housepainting a lot easier. Free-standing trellises, particularly if out in the open, must buck considerable wind push and need hefty posts set deep. Unless you consider it essential for strength, don't set the posts in concrete, which tends to catch water and hasten rot.

You'll want a design to suit your house and your purpose. Here are 13 ideas to get you started.

Five new designs to suit any house, new or old



Four ways to make a quick-and-easy trellis



Brighten Up Your Home

How to Install Tough

New cements now enable you to put handsome plastic laminates on your kitchen counters and furniture without special tools.

By Darrell Huff

NOW you can use those wonderful plastic laminates to top counters and tables you make or refinish yourself. Amazingly tough, they retain their bright beauty despite all normal kitchen abuse. That's why they are a favorite among housewives—and husbands—the country over.

But until recently it took a specialist to put the stuff on. New kinds of glue have changed that. You just spread the gunk, stick down the plastic and roll it with a rolling pin—no clamps or presses needed.

What's this plastic laminate? The kitchen variety is paper-plus-plastic: several layers of strong paper impregnated with phenol-formaldehyde resin, then a printed decorative sheet impregnated with melamine resin, then a top layer of melamine. This makes a rigid sheet that is usually 1/16 inch thick.

It comes in almost every imaginable color and pattern. You can buy it from building-supply houses and floor-covering shops under at least 11 different trade names, the best known of which is Formica.

Under the plastic you need a solid and smooth wooden surface. New counters should be ¾-inch exterior-grade fir plywood, firmly fastened to the cabinet with barbed or screw-shank nails. To mark for the sink cutout, place the metal sink trim right-side up and trace around the outside of the foot of the trim. Drill starter holes, cut about two inches inside the mark with a keyhole saw, and then cut to the line with a coping saw.

How to cut the plastic. Tools meant for soft metal work best, but you can use wood saws if you don't mind dulling the teeth.

- For straight cuts, try a plumber's saw—a fine-tooth tool that looks like a lady's-size carpenter's saw—or an ordinary crosscut with fine teeth.
- For curved cuts, you can use a hacksaw or coping saw. One of the cheap keyhole hacksaws is good for curves and will also handle short straight cuts.
- Power saws—portable, table, band or jig—are excel-

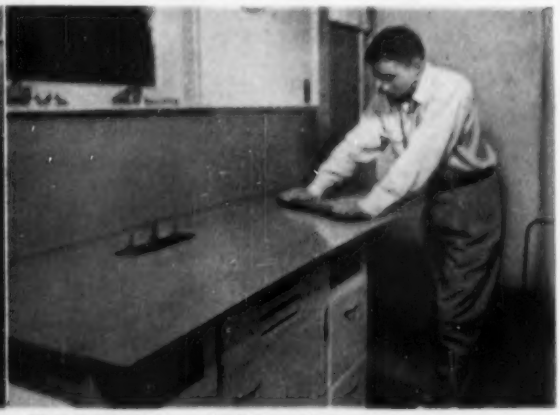
Plastic Counter Tops

1 GETTING ALL THE OLD OFF is the first step in re-covering with plastic laminate. You need a smooth, solid subsurface. If old top is in bad shape, cover with tempered hardboard. If it's very bad, replace it. At right above, the metal cove molding at wall is being installed before the plastic panel.

2 FINE-TOOTH SAW cuts the plastic panels neatly. Saw should be held at a low angle to prevent chipping. Cut the panels a bit wide.

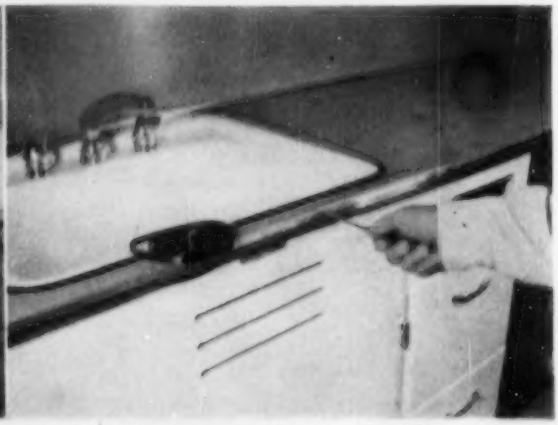
3 SPREAD GUNK on the panel back and plywood subsurface. Notches in the spreader regulate the amount. Let set for 40 minutes.

4 POSITION PANEL EXACTLY over sheet of wrapping paper, then slip out paper, press down. Be careful here; cement grabs fast.



5 ROLLING PIN and plenty of pressure guarantee a tight permanent bond. Note that sink has been removed, final cutout left for later.

6 PLASTIC OVERLAPPING counter edge is cut off—with a saw if there's much, with a block plane if there's little. Then file to a bevel.



7 METAL TRIM covers edges and corners. You need separate types for front edge, sink rim, cove bead at wall and cap on back-splash strip

lent, though best with fine-tooth metal-cutting blades. • Special Formica snips, which you may be able to borrow or rent, are very convenient. Ordinary tin snips can be used, but they will chip at least one side of the material.

With any tool *except a portable power saw,* cut the plastic with the good side up. Grease pencil or crayon is useful for marking. To reduce chipping when you must use too coarse a blade, cover the line with cellulose tape.

How to stick it down. There are two types of cement: one sticks tight immediately, one lets you move the plastic around a bit before it sets. Use a cement suggested by the manufacturer of the plastic.

The Formica people and most other makers recommend contact-bond cement, which grabs like iron the instant the material is laid in place. Spread the contact cement onto the back of the Formica, using the special trowel supplied with it. Put on a full coat; don't work it back and forth to make it go further. Right away, spread the adhesive the same way onto the top of the counter.

Let dry for at least 40 minutes, but not more than two hours. You'll know it's properly set when a bit of wrapping paper pressed gently onto the surface and then taken up does not take any adhesive with it.

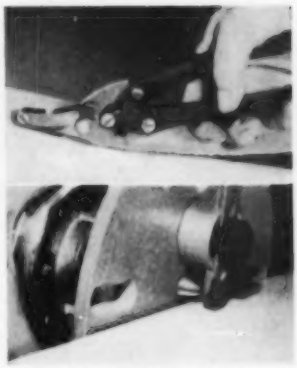
Now cover the counter surface with clean wrapping paper a bit wider than the counter. This paper is a slip sheet to help you place the plastic exactly.

Put the plastic on top of the paper and make sure it is exactly in position with a little bit to spare on all sides. You can't budge it once adhesive touches adhesive. Without letting the plastic shift, lift one side and pull out the paper. Let the plastic down and press tightly with your hands.

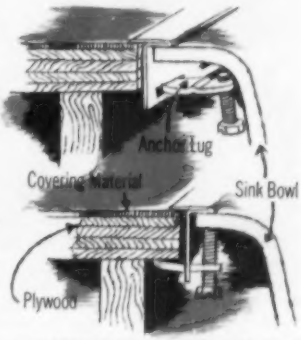
Rolling completes the bond. Your wife's rolling pin is okay, but a narrow roller—say three inches—is better. Cover every square inch and press hard. Use a mallet in the corners.

A back splash—a strip of plastic covering the wall directly behind the counter—is well worth the small extra effort. It is applied *after* the metal cove molding that trims the counter-wall joint. You can put it directly on a paint-free, sound plaster or plasterboard wall, using the same method as that for covering the counter. If over-counter cabinets prevent your using a paper slip sheet, hold the back-splash strip at a 45-degree angle to the wall, slip the bottom edge into the cove molding, position accurately, then push it into place.

You have two outs in case you goof: If you apply the adhesive but fail to lay the plastic before the cement loses its sticking power, you can reactivate it at any time within 24 hours with the heat from a heat



JOB GOES FASTER and easier if you can beg, borrow or rent special tools that the pros use. New Formica snips make cutting a snap. They remove a tiny sliver of the sheet in a sort of double cut that does not chip the material. Special router bits, carbide-tipped, and a template will trim the plastic edges perfectly, either flush and square or at the standard 25-degree bevel. Both cutters are made by Grace Fabri-Tool Co., 1238 Chase Ave., Cincinnati 19.

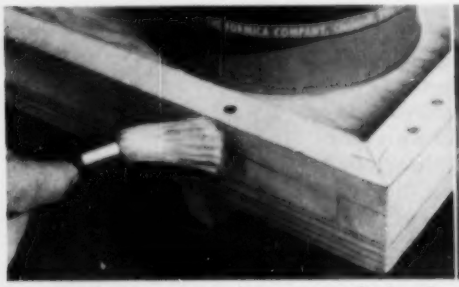


WATERPROOF SINK EDGE is easy to get with new clamp trim like one shown above. You hang sink, which must have flat rim, on brackets supplied with trim. Then spread calking under both arms of T trim and slip it into place from above. Finally, insert lugs and tighten bolts from underneath. Trim is permanent support for sink.

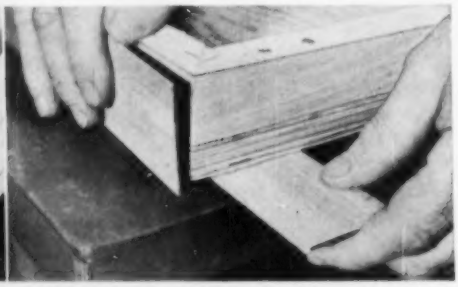
How to Plastic-Top a Table

THE plastic laminates are every bit as good—and good-looking—atop tables and chests as they are on counters. You can buy them in beautiful wood-grain patterns to match most furniture, and if you want to be extra fancy, you can even get a laminate made with real wood veneer. The real-wood type also comes in a cigaretteproof grade—a layer of metal foil carries off heat so that even a burning cigarette won't harm the top.

You top furniture the same way as counters. The edges can be left alone on an old piece. On new jobs, the edges can be painted, trimmed with metal or wood molding, or—for the finest result—banded with strips of the plastic. These photos show you how.

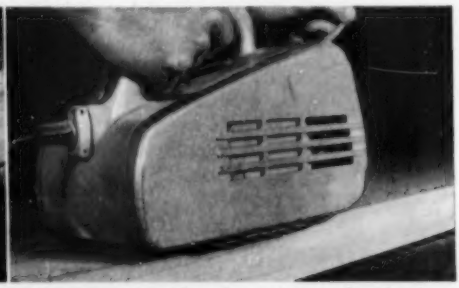


EDGES GET TWO COATS of cement, applied with a stiff brush 40 minutes apart. Back of plastic band gets a single coat. Let the cement set 40 minutes before sticking plastic to table. Banding works best with a fairly wide edge, made here by nailing mitered wood strips to the plywood top. Edge bands must be put on *before* you apply the top covering.



PLASTIC BAND, cut ¼ inch wider and an inch longer than needed, is stuck first to opposite edges of table. For accurate positioning, do this with table upside down on shims of plastic. Shims make band project beyond top just enough so that you can later trim it off flush. Press band on from the middle out, then hammer a wood block against it to get it on tight.

TRIM THE ENDS of the first two strips flush with the table. The remaining two strips can then be applied. Their ends are also cut off, but then beveled with a file or sandpaper. Notice the newspaper taped around the unbanded edge to keep sawdust out of the adhesive.



BELT SANDER makes fast trim on band edges. File, sanding block, plane or router could also be used. Top edge should be trimmed flush and square; bottom edge gets slight bevel. Table is now ready for top covering, which is applied like covering for kitchen counter.

lamp. (Don't use a torch; the adhesive is inflammable.) If you get the plastic down but must remove it, brush lacquer thinner against the glue joint, peel back the material and apply thinner as you go.

Trimming the edges. Over the outside counter edge you put metal channel or L molding. The simplest type just screws on. A new kind gives a neater, flush surface by snapping into clips that you nail into the plywood edge. (This is Silver Streak, made by Kinkead Industries, 5860 N. Pulaski Road, Chicago 30.)

The trim inside the sink cutout is critically important, since that is where water is most likely to get at the plywood. The clamp-down type—a T shape that covers sink rim and plastic edge—is best. END

A ONE-MAN TV STATION, Du Mont's flying-dot scanner can reproduce two movies simultaneously, one for broadcast, the other for studio preview, and insert commercials. Mirrors split intense light from the cathode-ray tube to scan films at right angles.

"Dragnet" (film)

"Disneyland" (film)

"I Love Lucy" (film)

Why TV Is Going Movie-Mad

It is easier, safer and more profitable to put shows on film—so celluloid is becoming the darling of the air waves.

By Wesley S. Griswold

THE jokes you hear on TV tonight—and the comedian's grin, too—may be older than you think. Often the show has been staged long ago, in front of a movie camera, and far away from the station that is broadcasting it for the first time. Television stations

BESIDE A "FLYING SAUCER"—a 5,000-watt light with a circular baffle, which diffuses a soft, pervading light over a studio set—Gene Lockhart discusses a film he is making for NBC-TV.

screened more than twice as much movie film last year as the nation's theaters did. The CBS network alone uses more film in 12 months than all of Hollywood's studios.

Thirty-eight percent of ABC's sponsored shows are on celluloid. So are 30 percent of NBC's evening programs. CBS's most popular presentation, "I Love Lucy," is a filmed show. So is "Dragnet," NBC's top favorite. And so is "Disneyland," ABC's new hit.

Nickelodeon, Vaudeville—and Live TV?

Soon you may be recalling the good old days of live television as sentimentally as any veteran theatergoer now remembers the nickelodeon and vaudeville. Improvements in film, in cameras and in studio accessories are helping film makers shove the live TV shows into history.

Producers often prefer to "can" their shows because it's easier on their ulcers. The sudden bedding-down of a star with a virus infection can be accepted with-

A CRAB DOLLY CREEPS IN on a scene from "His Honor, Homer Bell," a TV movie series. The camera pedestal moves up and down hydraulically; a crewman maneuvers the dolly itself.

"REHEARSING" A FILM SHOW consists of checking its timing, sound and picture quality a couple of hours before airing. This previewing of a "Disneyland" episode was shot with Tri-X film.

out a pang if, thanks to film, she'll be appearing on the Thursday-night show as usual.

Besides, film gives a show more scope, takes it off a limited stage and gives it the world to roam around in.

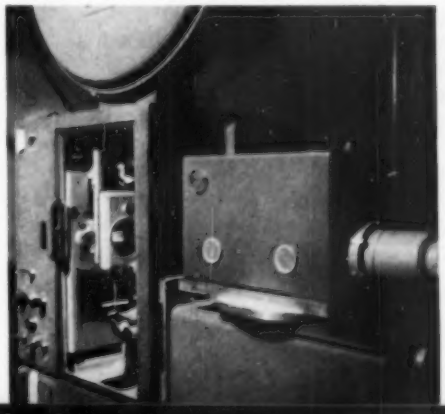
Even a lot of live shows are interlarded with film sequences, apart from the thousands of feet of commercials that have to be endured in an average week. Rear-projection shots, for instance, make live actors appear to be gazing off a studio-bound porch into anything from the Atlantic to the Grand Canyon.

Engineers prefer filmed TV shows because they are easier to handle technically.

Program planners like shows on film because they are precisely tailored to air time and contain no panic-making lapses or accidents. Furthermore, film neatly solves one frequent dilemma in programming:

Suppose a TV station in Tulsa doesn't find it profitable or convenient to rebroadcast a certain live show from New York at the hour when it goes on the air,

IN THE DARK CIRCLE at center below you see a frame from a movie being projected onto the tiny end of a Vidicon tube, facing it in a camera favored for televising movies.



A PROMISING STUNT is here staged by Du Mont, which teamed up its miniature Tel-Eye television camera with a 35-mm. movie camera. Director can see the scene as it will appear on TV.

yet the Tulsa station doesn't want to miss out on the program altogether. This calls for a kinescope—a film recording of a live show, made by aiming a special movie camera at a monitor screen while the show is under way.

The traffic in kinescopes is immense. CBS, for instance, alone sends out 2,500 16-mm. "kines" a week from its New York headquarters. Affiliated stations around the country telecast them any time they like.

"The Stu Erwin Show" (film)

Television stars usually prefer to put their shows on film because they can do in 39 weeks (the TV year) what it otherwise would take them 52 weeks to accomplish. During the summer months, the best of their filmed shows of the previous winter and spring can be re-run, leaving them free to accept other engagements or just take it easy.

There's a money angle, too. For a live show, a star is paid just once. On the other hand, film series for TV have first, second and sometimes third and fourth runs, like regular movies, though their titles usually change with the run. The star gets a diminishing percentage of his original salary for each successive run.

"It's like an annuity," Gene Lockhart says contentedly. Lockhart, plump, elfin veteran of scores of Hollywood movies and many stage productions, has been making a million-dollar film series, "His Honor, Homer Bell," for NBC in the old Brooklyn movie studios where the Talmadge sisters, Marie Dressler and Fatty Arbuckle started out.

Lockhart says that making movies for television is harder than making them for theaters. The script is devoured in gulps rather than nibbles. This puts a heavier strain on actors' memories. Homer Bell's adventures, for instance, are being filmed at the rate of nine to 11 minutes of screening time a day. Hollywood thinks it is lucky to complete 1½ minutes of a feature a day.

New Techniques Step Up the Pace

As a result of this accelerated tempo, a half-hour film for TV is routinely turned out in a week. Hollywood ordinarily takes a lumbering three or four weeks to shoot a half-hour segment of a full-length, hour-and-a-half feature picture.

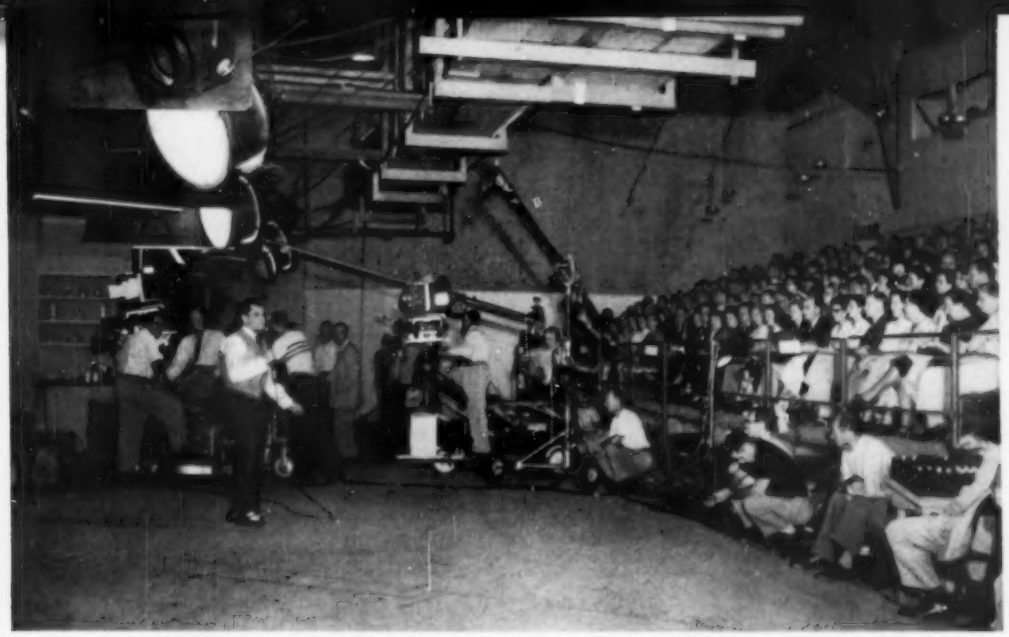
The stepped-up speed of film making is partly due to the increased mobility of the camera. It usually rides on a "crab" dolly, which crawls on four pairs of rubber-tired wheels that turn simultaneously in any desired direction. Hollywood's cameras, more often than not, travel on tracks, which have to be picked up and relaid for nearly every scene—a heavy-footed, time-consuming routine.

Lights and microphones for making TV films are almost always overhead, their treacherous trailing cords out of the way. So, freed of obstructions and unencumbered by tracks, a camera on a crab dolly is practically as agile as a circus horse, gliding smoothly to new positions.

"The Ray Milland Show" (film)

Du Mont hopes to streamline movie making still further with a rig that joins a movie camera and a closed-circuit baby TV camera on one dolly. With this, a director could at all times see just what his cameraman was up to and not have to wait for hours to see the day's "rushes."

The emergence of Eastman Kodak's



FOR THE "FEEL" OF LIVE TV, "I Love Lucy" (above) and other popular shows are filmed before an audience, whose reactions keep actors keyed up and are recorded as well.

new superfast Tri-X film was a boon to TV movie makers. With Tri-X, good pictures can be taken with an average of 50 to 55 foot-candles of illumination on the set instead of the 500 previously required. Sun effects can be obtained with "deuces" (2,000-watt spotlights) where 10,000- or 12,000-watt arcs were needed before. The cameraman can get along with smaller or fewer lights and thus save his boss money, or—and this is much more important—he can use the same light that slower films require and stop down the diaphragm of his camera. This distinctly improves the camera's depth of focus and does much to increase the three-dimensional effect of a scene on the television screen.

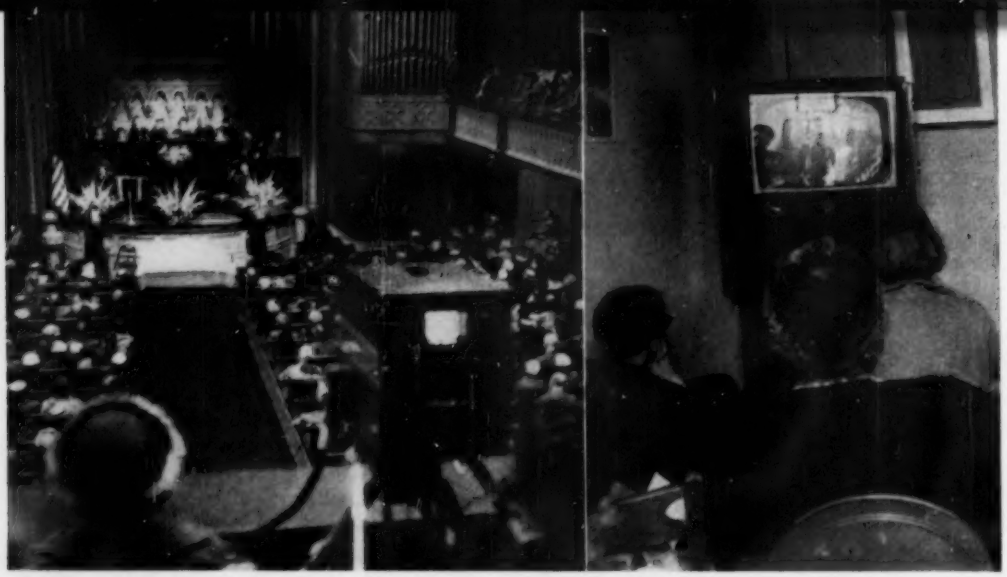
Clarity Begins at Home

The swing to film on TV has been speeded by the development of cameras ideally suited to transmitting movies to the home audiences.

A greatly improved version of RCA's midget Vidicon camera (PSM, May '50, p. 119), with a scanning tube smaller than a flashlight, makes it possible to reproduce film on TV with far greater clarity and truer shading than has been possible with that tired old workhorse, the iconoscope. Comparable results are obtained with the flying-dot scanner, which both Du Mont and Philco manufacture in slightly differing versions.

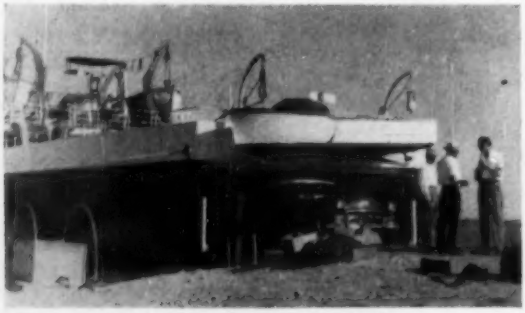
"You Bet Your Life" (film)

Last month, NBC began field-testing a device that may make the live TV show almost obsolete—sight-and-sound recording on magnetic tape. When tape recorders for TV are perfected, there will scarcely be any point in telecasting a show live. Why risk mistakes? The dress rehearsal can be put on tape, which is instantly ready to play back. Bloopers can be cut out, overly long sequences snipped, the best camera shots retained and the carefully edited production, tailored perfectly to time limitations, will be ready for airing in far less time than it now takes to develop and print film. Besides, when this show has served its purpose, the tape can be wiped off electronically and used over and over again. END



Private Television Brings Church Service to Overflow Crowd

When Dr. Norman Vincent Peale preaches in New York's Marble Collegiate Church, only 1,100 worshipers can crowd into the pews. But a TV camera in the rear gallery (above) brings the service to 700 more people watching four receivers in a chapel, an auditorium and two clubrooms. The TV set-up is operated by technicians who are also members of the congregation. Installed by Du Mont, it cost around $25,000.



Ferry Lets You Drive to Cuba

Going to Cuba? This converted landing ship will ferry you and your car from Key West, Fla., to Cardenas, Cuba. You walk aboard and a crewman backs your empty car into the hold. Contrary to Army practice, the 225-foot remodeled LSM loads at the opened stern.

One Push Opens Up This World

Charles E. Riddiford of the National Geographic Society, Washington, D.C., has invented a cheap collapsible globe that opens like an umbrella, then pulls down over the shaft, or axis, to form a sphere.

Huge Shield to Cut Tunnel Through River Bed

THE tunnel shield being set up above will bore a third tube under the Hudson River for the Lincoln Tunnel connecting New York and New Jersey. Propelled by 28 hydraulic jacks, it will cut through rock and silt of the river bed.

Announcer's Car Carries His Voice, Too

THROUGH the twin speakers on this $35,000 car, Leon Wilson's voice booms out over 100 acres to describe California parades and athletic events to spectators.

Test pilot of the world's weirdest aircraft tells

"How I Fly

J. F. ("Skeets") Coleman is the first man in history to fly an airplane straight up from the earth, deliberately land it straight down on its endgate, and live to tell the tale—which appears below.

As engineering test pilot for the Navy's XFY-1 VTO (vertical take-off) fighter, built by the Convair Division of General Dynamics Corp. at San Diego, Calif., this ex-Marine combat flier has made more than 350 successful flights in the radical new plane. Now 36, he has logged 4,500 air hours, including 100 hours in helicopters.

Skeets got his first taste of flying in the Civilian Pilot Training Program at the University of Iowa. He soloed a Cub in 1939. By 1942 he was a Marine shavetail. Four years and 91 South Pacific combat missions later, during which he earned the Air Medal and Distinguished Flying Cross, Coleman came home a lieutenant colonel.

By Skeets Coleman

JUST before the war, I used to put-put over Iowa farms, concentrating on flying a 45-horsepower Cub straight and level. Today I fly straight up from a Navy field in California in the first conventional airplane ever to rise vertically from take-off. The Navy calls this sensational new plane XFY-1, but you may know it as Pogo.

Its jet-prop engine is the most powerful ever built for a fighter-weight flying machine. After leaping straight up from the earth, Pogo moves easily through what we call "transition" into level flight. On landing, it comes to rest on its broad tail.

By carefully coordinating engine power and the plane's attitude, I can hover—motionless—like a helicopter, rise gently as a whisper or faster than a jet interceptor, or streak like a scared rabbit across the heavens.

To change power, I move a lever that alters fuel flow and the bite of the contra-rotating turboelectric steel props. The engine runs at constant speed.

Pogo's cockpit, except for the seat, resembles that of any experimental interceptor. You'd find the usual array of test instruments, scores of them, plus a few that show at a glance how fast Pogo climbs and descends. That's very important, especially near the ground.

As I climb in, I ease into the seat. I lie down, much as you might in a lounge chair. Actually, the back is about 30 degrees above horizontal. Getting buckled in is the toughest part of the flight. Try putting on your suspenders while lying on your back. I check the controls, and ground workers roll the ladder away.

Pogo Goes Up Like an Elevator

Jet pilots know that you can start the fire and take off, without waiting for the engine to warm up. But I've got too many piston-engine hours under my belt to take off "cold." So I wait a half-minute, open the engine to two-thirds of its rated 5,850 pounds of thrust (equivalent to 5,850 horsepower), and start going up like an elevator.

Right now my cockpit cover is open, because during the first 150 feet of climb I must be ready to look down over my left shoulder. That's necessary both to orient myself and gauge my altitude. Once we considered putting in a rear-view mirror to watch the ground on take-

the Pogo Plane"

In rapid-fire order he (a) manufactured a gimmick that turns off radio commercials, (b) earned a BS degree at UCLA in 1947, (c) took graduate work in psychology, (d) studied aeronautical engineering, (e) operated a flying school in California, (f) got married, and (g) latched onto a job at Convair in 1951 as a test pilot. With his wife, Lee, and two-year-old daughter, Nancy Lee, he lives in Del Mar, at the northern tip of San Diego.

Coleman's current job is to wring out the prototype Pogo and discover how less experienced pilots can learn to fly this advanced plane. When that's done, he hopes to have more time for golf and tennis again, because he's gained 10 pounds while flying Pogo. He figures a fellow who is carrying 170 pounds on a 5-foot-9½ frame needs more exercise than reining 5,850 horses around the sky can provide.—*Andrew R. Boone.*

POGO BACKS DOWN onto four tail casters when pilot gently cuts power on propellers to just less than the plane's weight.

off and landing. We'd thought some of trying a periscope and ground-glass screen. I vetoed both, because I wanted to avoid anything that might make it more difficult for other pilots to learn by instruction what I'm learning the hard way.

That first 150 feet is the toughest, both going up and coming down. That's the line above which I can explode myself out of the cockpit and land safely by parachute, and below which odds aren't so good.

When flying vertically, the plane literally hangs on the props. At 200 feet I'm ready for the transition into horizontal flight, when the wings will take over. In a pinch, Pogo can change over at 50 feet, but that's more risky.

Stick Straightens Pogo Out

Things happen fast. I push the stick forward, nosing Pogo over. At the same time I ease the seat backwards so I'll be sitting comfortably instead of leaning forward. The hatch closes automatically.

Nosing Pogo over is like driving your car over the crest of a hill. I go from vertical to horizontal exactly as a pilot dives any airplane from horizontal, by shoving the stick forward.

Landing is different. Say I'm cruising at 260 knots. If I should pull the stick back, I'd climb several thousand feet; Pogo, having a small wing and tremendous power, is a high-speed plane. I make a normal approach until I'm down to about 50 feet. There I start jockeying the throttle, at the same time pulling the nose higher and higher. Slowly I pull Pogo into a nose-up attitude. I can stop anywhere during this change. If I undershoot my landing spot, I can creep in at five knots.

Over my left shoulder I see the concrete apron. For a moment, I hang motionless. I move the throttle a fraction, taking off 100 pounds of thrust. Ever try to back your car into the garage with only inches to spare along the walls? With experience, I've learned to back Pogo down without scratching walls that might be there. It's a gentle, precise

"Nosing Pogo over," its pilot "is like driving your

maneuver. Where airliners settle for landing at 500 feet a minute, Pogo descends at only 300, nice and comfortable.

When the casters are only two feet off, I hit the throttle slightly, and I hit it again at one foot. Then I let it go. At ground idle, the engine adds slight negative buoyancy. That helps the plane to stand sturdily, even in a 20-knot wind.

Pogo isn't a plane that you get in and fly away. When I learned two years ago that something of this sort was projected, I buttonholed Sam Shannon, Convair's chief of experimental flight at San Diego. "Sam," I said, "I'd like to test Pogo."

I told him I was peculiarly qualified—and I hope I accented the right word. I had had considerable experience in both Navy and Marines in carrier landing, and I was a jet-qualified pilot.

Two months later Sam gave me the nod, and some good advice: "Do whatever you can to get the feel."

A Dry Run—on Jacks

Day after day I sat in a full-size wood mock-up of Pogo, fingering controls, studying instruments, adjusting and readjusting the seat. The mock-up was rigged to move between vertical and horizontal on hydraulic jacks. I plotted my cone of vision, to make certain exactly how much I could see down over my shoulder.

I observed models free-flying in a wind tunnel at Langley Field, Va. Back in San Diego I climbed into a test-stand cockpit. Repeatedly I "flew" a duplicate of the engine in Pogo. The engine could rise only five feet, but it gave me experience in judging how much power

writes in this article, car over the crest of a hill."

I needed to rise, hover and settle down again.

For the delicate feel, I began to fly helicopters. Early helicopter flights gave me an eerie feeling. I wanted horizontal speed to support the wings. Gradually, though, I became accustomed to leaping vertically off the ground.

Pogo Climbs Out of the Barrel

The day I first took Pogo up, last June 2, I flew "in a barrel"—a big Navy hangar at Moffett Field, Calif. A pair of cables hooked to the nose would catch me should the engine fail. On August 1—280 tethered flights later—I rose from Moffett in history's first vertical free flight. It was September 3 when I put the plane for the first time through the complete flight cycle.

Often I am asked: "Is Pogo really good for anything?"

Well, how about flying them as fighters from the decks of merchantmen and Navy ships to protect convoys and the fleet? They could come home to roost and re-arm. Or dispersing many of these powerful slingshots on farms, or deep within woods, to leap upward when an alarm sounds? Perhaps the day will come when you will fly straight up in a Pogo-type airliner. This may solve the problem of operating from cramped airports in the middle of cities.

Figuring out jobs for Pogo is mostly other people's problem. Right now I've got my hands full learning to fly a machine that's both the world's slowest and fastest propellered airplane. Once I give it full throttle, I figure Pogo and I will nudge the speed of sound. END

GOING UP, Pogo hangs on two 16-foot, three-bladed props spun in opposite directions by 5,850-hp. Allison gas turbine. Wings help only as it eases into level flight at 200 feet.

'55 Appliances Make KP Easier

Electric kitchen center combines five appliances—stove, sink, dishwasher, clothes washer-dryer and garbage disposer—into a single unit. A one-piece stainless-steel counter top 8½ feet long covers it. Plumbing and wiring for individual machines are interconnected so that a single hookup installs the whole unit. General Electric sells the works for about $1,500.

A full-width oven—30 inches—makes space for two separate broilers in this Westinghouse range. The cook can broil six or eight steaks to order, some well done, some medium rare, and serve them all up hot at the same time. On the top, an automatic electronic unit cuts off the current if a pot boils dry.

Cold-drink dispenser automatically mixes concentrated fruit juices with water from two-quart tank in this Westinghouse refrigerator-freezer, which sells for $550.

Wall refrigerator by GE hangs from a bracket screwed to studs. Its shallow shelves put all food within easy reach. There's eight cubic feet of ordinary refrigerator storage and a freezer section (shown open) holding 73 pounds. Price: $600-$800.

Home water cooler for kitchen or recreation room fits into any small spot that's handy since it needs no plumbing. Water is poured into a gallon reservoir under the lid and waste water drains off into a tank that lifts out at the front. For the many Western families who buy bottled drinking water, the standard five-gallon jug of spring water fits into the top. A push button low enough for a child's reach turns on the tap. Westinghouse calls it a Cooleret and sells it for about $150.

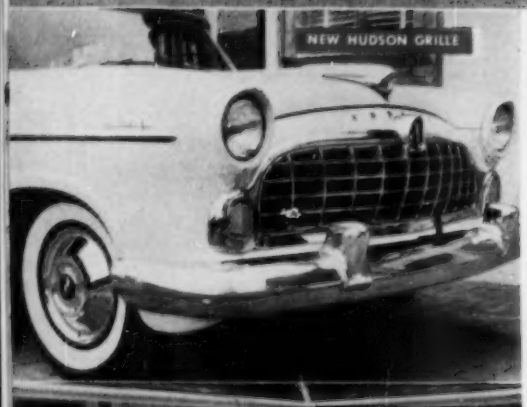
New Wire Shrinks Motors

SMALLER motors for tools and appliances are promised by a new type of insulation for the wire winding. It is very thin but withstands considerable heat. By using this Alkanex wire, a 20-horsepower motor could be upgraded to do the job of a 25-horsepower model. General Electric developed it.

Hitching Post Warms Engine

A MAN without a garage in Solna, Sweden, can park in the street without worrying about cold-weather starting. He just plugs into a curbside electrical outlet that runs a special heater fixed under the car's hood. Cost: $20 a year.

HUDSON HORNET


NEW HUDSON GRILLE

NEW NASH GRILLE

NASH AMBASSADOR

Hudson and Nash Get V-8 Engines

NEW body styling—the first major change since 1948—and new engine choices are the main 1955 headlines from Hudson. Optional on the Hornet, the top car in the line, is a big OHV V-8 engine rated at upwards of 205 horsepower. Smaller L-head sixes rated at 170, 160, 114, and 104 hp. are also available, as are manual, overdrive, or Hydra-Matic transmissions and air conditioning. Other features include reclining seats, twin beds, a new cowl-width air intake, visored headlights, and wrapped bumpers.

For Nash, a similar V-8—which closely resembles the smaller of the two new Packard engines (see page 154) and which is reportedly sold to American Motors by Packard—powers the Ambassador, the top car in the 1955 line. Like Hudson's, it is a 320-cubic-inch engine of modern design. Sixes of approximately 140, 130, 110, and 100 horsepower are also available, the first two on the Ambassador and the others on the Statesman. Handiest recognition feature: Headlights have been plucked off the fenders and tucked in the grille.

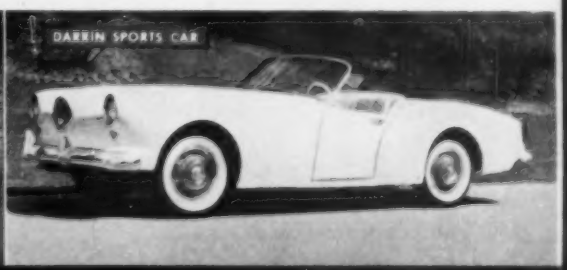
Willys Chops Prices, Pushes Jeep

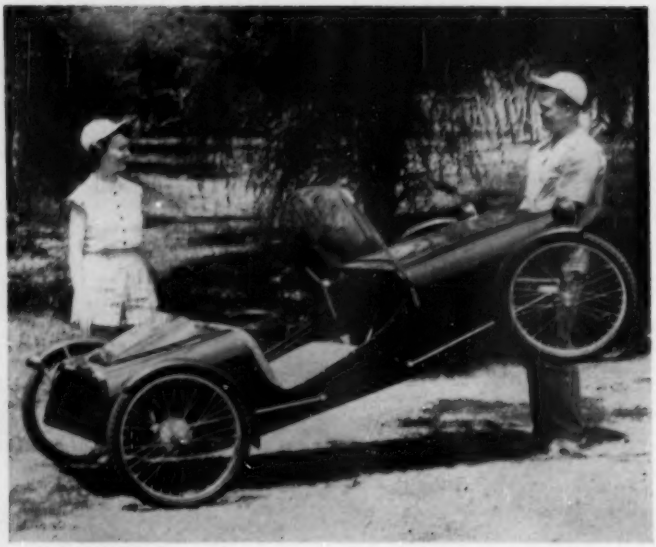
KAISER-WILLYS last month slashed away in two directions—reducing its number of passenger-car models for '55 from 10 to three, and cutting prices.

Announcing its new vehicles, the company said it was limiting passenger types to the Kaiser Manhattan, the two-toned Willys hardtop and the Ace four-door sedan. The Henry J is being dropped.

Retail price on the hardtop at the factory, Federal tax included, was fixed at $1,795, down $400. That on the sedan is $1,725, down $300. Prices on the Kaiser, the Darrin sports car and the station wagon—none of them changed materially from '54—are the same.

Willys was proudest of its new four-wheel-drive Jeep, with a wheelbase up one inch to 81 and an over-all length boosted 2¾ inches to 131¾.





Plastic Car Has Rear Engine of Only Five Hp.

JIM ROOT, a Kansas City automobile engineer, has built a car that can go 60 miles an hour—on only five horsepower.

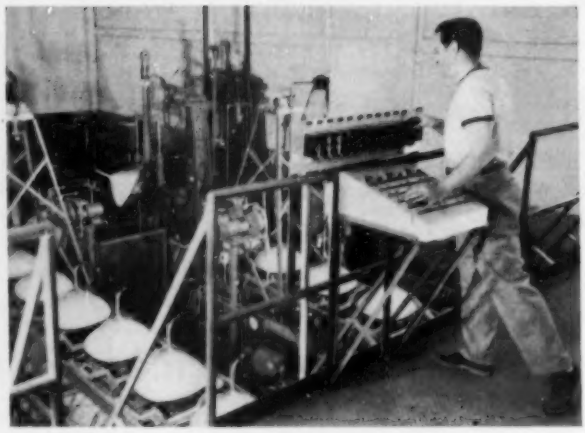
It's a cross between an automobile and a motor bike. The wheels were salvaged from a motorcycle. The body is made of plastic. A tiny compartment behind the seat houses the engine. Root calls his car the "Rootster."

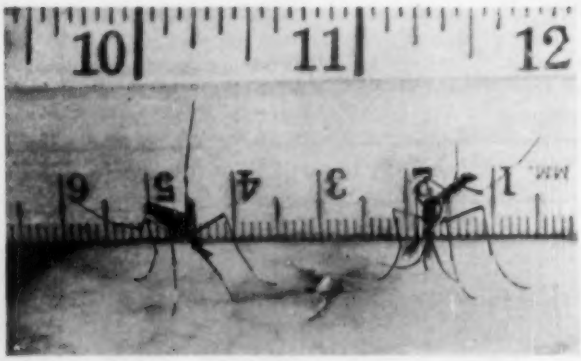
Weighing only 200 pounds, its cruising speed is 35.

TV Tubes Are Moved by Push Button

AS TELEVISION picture tubes get bigger and heavier, they are harder to handle in manufacture. So one company does it by push button—a workman at a control console throws a switch, and mechanical arms move the tubes along the production line.

Shown here is a part of the Sylvania factory at Seneca Falls, N. Y. The arms, capable of lifting 500 pounds, seize the fragile tubes by suction.





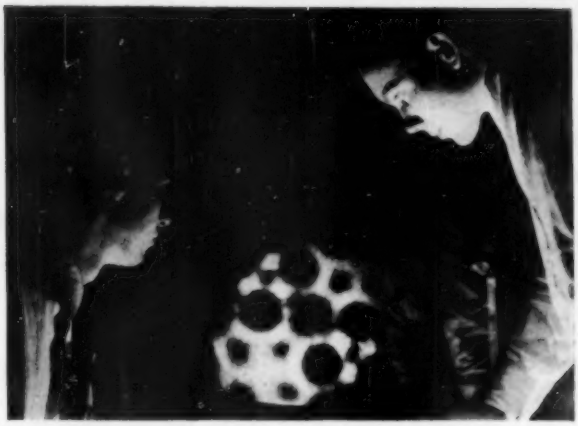
Super Skeeters Bred to Kill Little Ones

IN HAWAII they are breeding big mosquitoes to kill smaller ones. The big fellows, South African "cannibals" harmless to man, are imported and encouraged to multiply because their larvae feed on the young of native disease-carrying mosquitoes.

An idea of the cannibal's size can be gained from comparison with a ruler.

Crocodile Jaw Opens to Show Car's Innards

GARAGE mechanics who suffer from claustrophobia (fear of being in narrow spaces) will love this new Jensen 541, recently exhibited in London. To work on the car's six-cylinder engine, you simply lift the hood, headlights and grille as one unit, as shown at right. This arrangement, the manufacturer points out, lets you see what's what without straining over fat fenders.



Crystals Magnified One Million Times

TO THE scientists at left, the picture they are so intently studying is more interesting than a TV spectacular to most of us. It is the electron-emission pattern of a single tungsten crystal magnified a million times. The big blowup is made possible by the recent adaptation of the field-emission microscope as a research tool by scientists of the General Electric Research Laboratory.

They Say Now .....

JACK W. RIZIKA, MIT: *"There is reason to assume that any aero-technological gap which once existed between the USSR and the Western powers is all but closed."*

BRIG. GEN. DAVID SARNOFF, CHAIRMAN OF THE BOARD, RCA: *"I have always proceeded on the theory that whatever the mind of man can imagine, the mind of man can produce."*

DR. EUGENE AYRES, GULF RESEARCH AND DEVELOPMENT CO.: *"If it is possible to teach genius instead of merely hoping it will come along, the future will belong to the society that first discovers how."*

PHIL PRETZ, FORD ENGINEER: *"We expect to see highways where drivers are encouraged to travel in the proper speed lanes . . . highways which will steer the car if the driver has a momentary lapse."*

THOMAS E. MURRAY, COMMISSIONER, U. S. ATOMIC ENERGY COMMISSION: *"Atomic energy has resulted in the greatest change in man's relations with nature since the fateful day in the Garden of Eden."*

An investigator from the Los Angeles County sheriff's auto-theft detail checks up on wrecks

Detectives reveal the latest tricks of master auto thieves to help you avoid the embarrassing and costly confession:

"My Title Has

Lieut. Richard Brooks, chief of Los Angeles stolen-car squad, scans theft reports.

YOUR opportunities for buying a title only, when you think that you're getting a car to go along with it, are now greater than ever.

That's because, right in the midst of the biggest wave of car-stealing in history, the professional thief has learned how to provide each hot car he sells with a title that may look—in fact may be—perfectly valid and legal.

But however good the title is, the car is hot, and its driver, sooner or later, is very likely to be stopped by a cop who will say, "Sorry, but you are driving a stolen car." The vehicle, of course, will be returned to its proper owner—and the man who bought it will be out his money.

But if fraudulent titles come high to the customer, they are fairly easy to the car thief. He gets them in lots of ways, all over the U.S.:

- In Pennsylvania, one thief went to the motor vehicle bureau, posed as a runner from a reputable dealer, and pre-

whose title papers may have been transferred to stolen vehicles.

By Andrew R. Boone and Gardner Soule

No Car"

sented what appeared to be 15 applications for titles to new cars that had just been delivered to the dealer. The thief got the titles. Then he proceeded to steal cars that matched in color and model the fictitious autos he had described. He changed the engine and serial numbers to correspond with those he had dreamed up on his applications. Then he sold the hot cars, each one accompanied by a dealer's title.

- In New York, a ring of thieves snatched autos in New York City, drove them to Poughkeepsie. There they proceeded to change engine and serial numbers on the hot cars; to fill out registration blanks—available in New York to anyone—to conform to the phony numbers; and, with a fake rubber stamp, to affix what looked like the seal of the New York motor vehicle bureau. The cars were then sold either by want ads or by dealers in league with the ring. One crook alone sold cars to six trusting clergymen.
- In Los Angeles, an auto thief purchased the wreck of a

How cops fingerprint an engine number

Suspect number is wiped with gasoline.

Grime is scraped off with wire brush.

Lampblack is dusted over surface.

Sticky tape, pressed on, brings up print.

Tape is stuck on card to make copy that can be examined for signs of forgery.

green '53 Chevvy. Then he stole an identical car. He changed engine and serial numbers to match those on the papers of the wreck, and sold it, using the registration of the wrecked car. It took the L.A. officers, who watch what happens to wrecks, just two weeks to track down the crime and to bring the bad news to the perfectly innocent customer. In this case, however, because the title to the wreck was perfectly sound, the customer ended up with the engine—the only part of the wreck that could be found.

How thieves make a phony plate

Cops keep lists of licenses from stolen cars. To throw them off, thieves may cut plates apart and carefully splice them into new numbers to match switched registration papers.

Two for the Money

- In several states, this has occurred: The thief buys, legitimately, a new car and gets with it good papers. Next he reports his registration papers lost, gets a duplicate set, and has two. Then he steals a matching car, changes its engine number to match that on both sets of papers, and sells both cars. Not even the customer who buys the legitimately registered car is safe. The thief probably got it for only a down payment; its real owner is an auto dealer or finance company to whom it must be returned.
- In 13 states, where no proof of ownership is required when you register a car, there is nothing to getting title papers. The crook applies—he doesn't need a bill of sale, a last year's license, or anything else, for that matter—and gets a title. Then he peddles a hot car under this perfectly legal registration. The legality is no protection for the thief's customer, however, for a crime was committed when the auto was stolen, and the rightful owner will get the car back whenever it is located.

Title-switchers and their titles are so convincing these days that they fool not only the public, but also experts like banks, loan companies and even auto dealers. In California, a title-fraud lad buys a wreck for its papers. Then he borrows or rents an identical car. He attaches a metal plate with the wreck's serial number to the other car's body, and smears on grease and dirt so that the number appears genuine. Then he drives to a bank or finance company and, with the wreck's papers, borrows all he can. Then he removes the phony serial number, returns the car to its owner, and disappears.

Or the crook buys a new car by making only a down payment, forges papers to indicate that the vehicle is entirely paid for, and drives around obtaining loans on it. A recent

case like this caused financial distress to five banks within 250 miles: All had loaned on the same auto.

License plates are always needed to go along with the titles. This is no problem to thieves smart enough to evolve the title racket. The plates are obtained in one of two ways: By stealing a set. Or by stealing two sets of plates, sawing them apart, and then soldering together halves of each set to make new plates with phony numbers.

How can you recognize the title-switcher? You can't. They follow no pattern, fall in no special age group. One recently caught was 71 years old.

Girls Give That Feminine Touch

Or he can be a she. Title-switchers sometimes use even girls as "pushers." In New York City, recently, four title-switched Cadillac convertibles, identical down to the same engine and serial numbers, were sold the same day by glamour girls to legitimate used-car lots. Each girl explained that she was "a TV actress who had to catch a plane to Hollywood."

If you can't recognize 'em, is there a sure way not to get stung? There is: Know the man who sells you a car.

If you are buying from a personal acquaintance, you are probably safe—if he, in turn, knows he got the car from a reliable seller. If you are buying from a dealer new to you, ask the local Better Business Bureau about him. If he is a responsible local dealer, he will, if he sells you a stolen car he has innocently purchased, repay your money.

If you are dealing with an individual you do not know, avoid falling for a big bargain. Something is wrong if a man (or glamour puss) is willing to sell you a car for less than could be obtained at the nearest used-car lot. Check the numbers on his papers against engine and serial numbers—a garage can do this easily. But don't stop there. Check the registration at the motor vehicle department—a matter of a few minutes. Ask him for *his* bill of sale, and check with the previous owner.

"If everybody knew the person he was doing business with," said an auto-theft detective, "title-switching would be no problem at all."

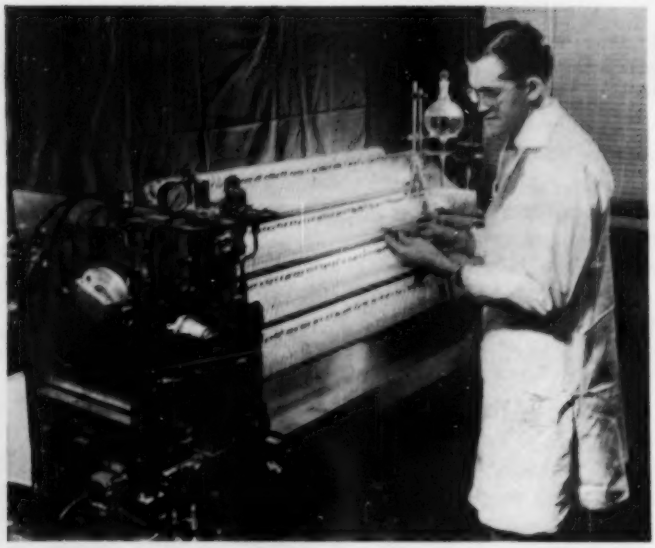
But, you ask, isn't the law able to do anything about title-switchers? It sure is. A few details:

In New York, the law makes it forgery to use a phony state stamp on registration papers. Forging titles, therefore,

[*Continued on page 302*]

Skin test may show up hot car

Be wary of buying a current-model car from a stranger if scratching the finish reveals a different original color underneath. It may be a stolen car that has been repainted to match the title papers taken from a wreck.



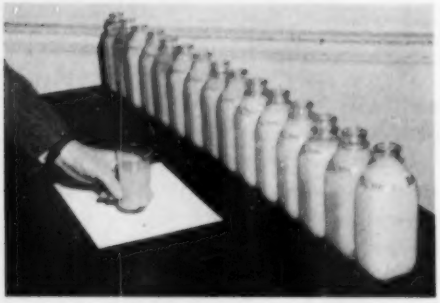
Lab Machine Analyzes ACTH Hormone

A CHEMICAL company's machine has completed a job in four and a half years that would have taken one person 165 years to accomplish.

Called a countercurrent distribution machine, it isolated eight components from the hormone ACTH. One component was found to be the most powerful. Dr. Paul H. Bell (left) of American Cyanamid directed the research.

New Antenna Is Scoop-Shaped

LOOKING like a giant sugar scoop, a new kind of microwave relay antenna developed by Bell Laboratories can handle 20,000 telephone circuits or 30 television programs at one time. The antennas will stand on towers as high as 300 feet.



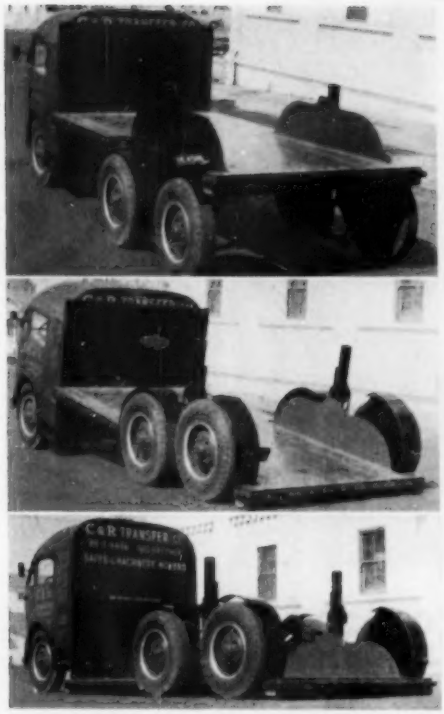
Here's Your Vitamin—in a Berry

THE richest known source of vitamin C is the berry juice of the acerola tree. Now being produced in Puerto Rico, one six-ounce glass of it equals, in vitamin content, 15 quarts of orange juice.

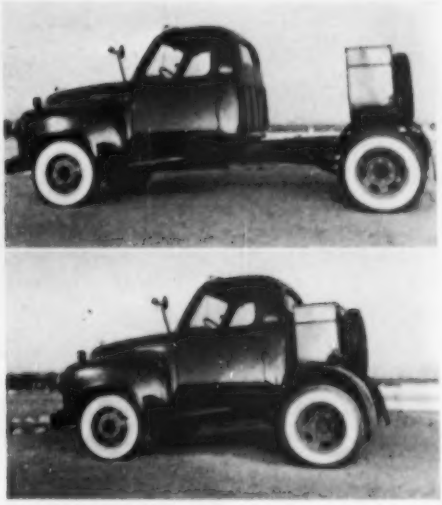
Key Carrier Glows in the Dark

EXPOSE this key case to the light for a while, and it will glow in the dark. Made of polyethylene plastic, it has been treated to store up light energy by day and emit it at night. It is manufactured by the leather-goods house of Osborn Brothers, 223 Jackson Blvd., Chicago 6.

Trick Trucks Transform Transport

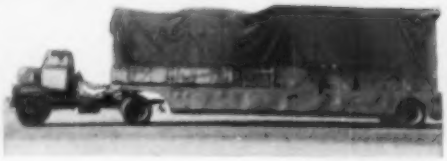


Squatting Truck has a bed that goes up and down hydraulically for easier loading and unloading. It's in operation in San Diego, Calif. Called the Hi-Lo-Truck, it is a prototype with patents pending for manufacture. The C & R Transfer Co. uses it.



Stretchable Truck, the Trailer-Toter, made by the Whatoff Motor Co., Ames, Iowa, can expand its wheelbase from 82½ to 120 inches in about 10 minutes. A winch extends and shrinks the frame. Slip joints simplify changing drive shafts.

Truck-Toting Truck is a converted, four-car trailer that can carry five small trucks—one atop the cab. Removable hydraulic jacks cock the vehicles at angles. The truck, which can be converted for general freight, was designed by Nicholas Demos of the Kenosha (Wis.) Auto Transport Corp.



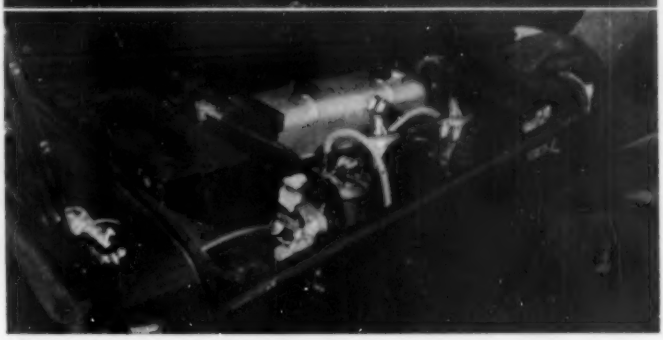
JAZZIER JAGS have new power and more choices. In new XK-140 series (top photo) rated power has been increased 30 hp. to 190, mainly by higher valve lift and better breathing. A special cylinder head can bring output up to 210 hp. Other options include automatic transmission or overdrive, and roadster, coupe, convertible or sedan bodies. Below it is D-type competition model now offered for general sale (base price: $5,300 at factory). A 250-hp. engine tools it up to 172 m.p.h.

English Sports Cars Get More Zip

TRIUMPH T.R.2 now has an optional detachable glass-fiber hardtop that can be left home in the garage if the weather looks promising. Car makes over 100 m.p.h. in road trim, and has hit 124 in racing condition. It has small engine (1,991 cc.) but is extremely light, weighing less than one ton dry. Price: $2,499.

Tot Cot Overhead Keeps Babies from Underfoot

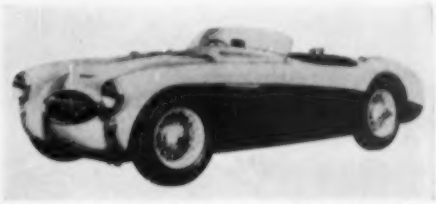
A LONG plane trip with a lap-held baby is no fun for a mother, and British Overseas Airways Corp. decided to do something about it. The result, demonstrated at left, is called a "Sky-Cot." It fastens securely to the parcel rack overhead, has a protective net to keep the little one from popping out in rough air, and still keeps him handy for needed maternal attentions.



SASSIER MG has more perk under its bonnet, after years of getting by on tiny engines. The new 1500 MG at right has a 1.5-liter engine (actually 1,466 cc.), about 17 percent more displacement than before. The increase is solely in the bore, which is up from 66.5 to 72 mm. This increases horsepower from 57 to 63, and torque from 72 to 78 pounds-feet. Car is noticeably friskier to drive, clocking 0-60 times of about 16 seconds and top speeds of around 85. Price has been cut to $1,995.

More power—achieved primarily through engine refinements—and more factory options are the dominant notes in the new crop of imported British sports cars. In several there are slightly more concessions to driver comfort. Prices are either held or reduced slightly, though it is still possible to blow a wad.

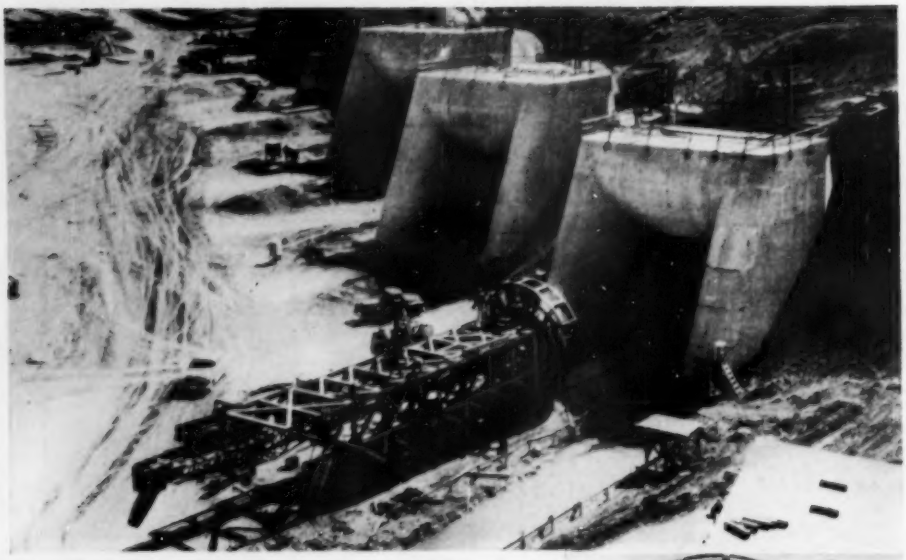
BRISTOL 405 combines elegance with performance, costs $6,300 at the factory. It gets well over 100 m.p.h. from 105 hp. Built by an aircraft firm, it has had long wind-tunnel testing.



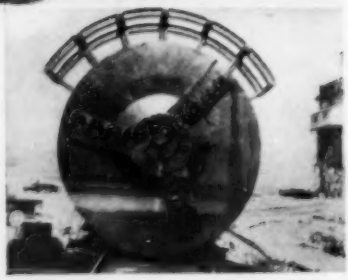
AUSTIN-HEALEY 100S is special competition model of sports car. Engine has been upped to 130 hp. and oil cooler and disk brakes fitted. A specially modified version has done 192 m.p.h.

Sun Replaces Battery in Peewee Transmitter

Solar energy, falling on selenium cells, powers the tiny radio transmitter shown with its builder, GE engineer Edward Keonjian. Its messages can be picked up at a range of 100 feet by a home- or car-radio. Transistors rather than vacuum tubes are used in its circuits, and range can be increased by using more or different solar-energy converters.



Mechanical Worm Bores Tunnels



THIS monstrous mechanical earthworm, weighing 100 tons, will bore six long flood control tunnels at the Oahe Dam in South Dakota. As it inches forward on rails, steel teeth on the face (right) bite into dirt and rock while hydraulic jacks force the 10-inch knives and tapered cutting disks against the earth. Similar smaller machines dig coal, but this is the first reported use of "continuous mining" in large-scale tunneling.

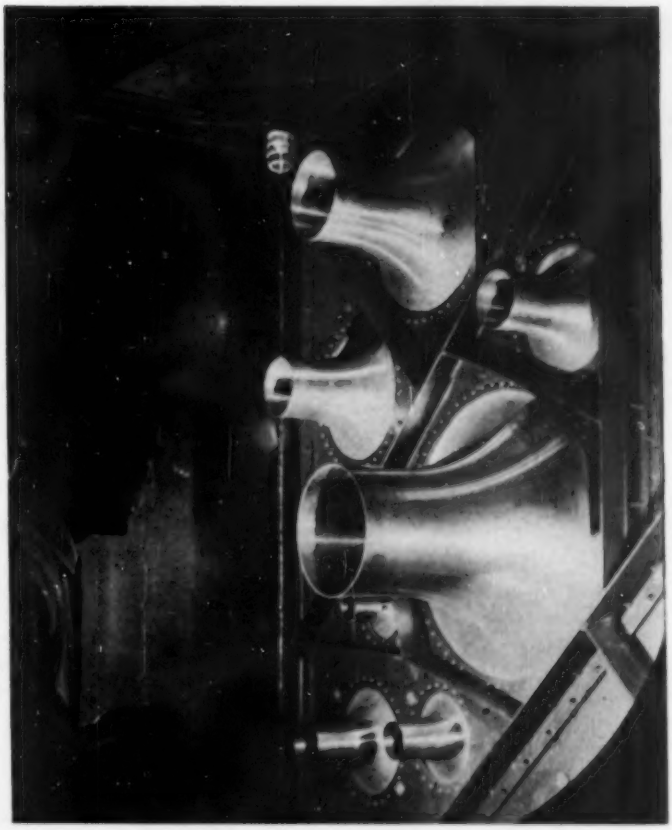
Buick Introduces Hardtop "Convertible" with Four Doors

NEWEST wrinkle in hardtop "convertibles" is this four-door model, demonstrated here by Buick's general manager, Ivan Wiles. It was displayed last month at the GM Motorama in New York. Conventionally, hardtops have only two doors because they have no center posts. To get four doors, Buick built center posts that rise only halfway.

Nozzles Show How Diesels Can Work Harder

THOSE strange horns at right blow air at motors and generators used in diesel locomotives. The idea is to find out how fast the machines can be run without burning themselves up. That depends on how the cooling air is blown past them. The queer nozzles, which can measure air flow very accurately, help General Electric engineers in testing different fan designs.

▶▶▶The electric fork trucks at a big warehouse were so quiet that they were a hazard. The solution: ball bearings, placed loose in the hub caps. Now workmen hear the jingle of an approaching truck long before it is near.



Whirling Mikes Listen to Bell On Telephone

SPINNING microphones measure the noise your telephone bell makes. This sound integrator, developed by Bell Labs to check on the bell and volume control of the new adjustable telephone set, has microphones mounted on the four curved posts. These spin around the ringing telephone in the center, and the mikes pick up the bell's sound as they whirl.

How to Win

A Scotchman who lived 150 years ago has now granted both to the almost unknown father of modern magnetic recording.

By Herbert Yahraes

ON THE desk in his cluttered laboratory in Chicago, a young man named Marvin Camras found a letter one morning some weeks ago telling him that he would soon receive a John Scott Award.

Puzzled, he telephoned some of his more worldly minded associates in the Armour Research Foundation of Illinois Institute of Technology. They congratulated him warmly, because it meant that:

- Mr. Camras would receive $1,000.
- His name, on the roster of John Scott Award winners, would be placed with the names of the twentieth century's most illustrious inventors.

But who was John Scott? No one could tell Marvin Camras anything except that he was a chemist who lived long ago in Edinburgh, Scotland. In 1816, Scott, for reasons that no one is now certain about, bequeathed $4,000 to the City of Philadelphia, and asked that the income from this bequest "be distributed among ingenious men and women who make useful inventions."

A Distinguished List Gets a New Name

During the next 100 years, about 400 inventors received small gifts from the income that John Scott's $4,000 bequest earned. Even so, the fund grew to $100,000. Since then, many more, and larger, awards have been made to such ingenious men and women as:

Thomas A. Edison	Marie Curie
Orville Wright	Nikola Tesla
Guglielmo Marconi	Edwin H. Land
Lee De Forest	Vannevar Bush
Charles F. Kettering	Irving Langmuir
Edwin H. Armstrong	Eugene J. Houdry

Nevertheless, more money remains to be distributed and Marvin Camras became one of five current beneficiaries of John Scott's thoughtfulness in a presentation ceremony held in New York last month.

To trace the ways that all of the winners of John Scott Awards qualified for the honor, one would have to write a detailed history of science and invention since 1816. Even to tell how Marvin Camras did it, one must turn the clock back about 30 years.

At 38, Mr. Camras is the father of modern magnetic recording. A shy, soft-spoken man with a slight accent, he has received little publicity outside of tech-

IN HIS LABORATORY, where lately he has been working on high-fidelity reproduction of sound from two sound tracks, Marvin Camras is shown below operating a magnetic-recording test rack.

Fame and $1,000

Camras took this picture, as he and his wife recorded "voice snapshots" of their two sons.

nical journals. Yet an $80,000,000-a-year industry has been built largely on his discoveries.

He Holds Over 200 Patents

His inventions are found in nearly all the tape- and wire-recorders now made. He holds more than 50 patents in this country and some 150 abroad. He has influenced developments in motion pictures, radio and television, office machinery, high-speed electronic computers and many other devices. Your son's life will probably be affected more greatly than your own by Mr. Camras' work.

Eventually, Mr. Camras predicts, most long-playing, high-fidelity records will be on tape instead of discs. With home recorders you may be able to take down and preserve for a day or a century not only radio programs, as at present, but also television. With a unit small enough to be hidden in your pocket, you will be able to record the conversation of your lunch companion and the testimony of people who saw your fender smashed.

With this same pocket recorder you will be able to make "voice snapshots," and use these snapshots and other material to prepare a sound track for home movies. If you are in industry, you will be able to turn over the operation of a complex machine to another complex machine whose brain is made of magnetic

tape. Marvin Camras began the study of his profession at the age of five, taking a flashlight apart and mounting the parts in a cigar box to make a lantern. A few years later he made a crude telephone, using a pillbox filled with granules of coke as a microphone. He and a cousin used it between their homes on Chicago's West Side. Then the boys built a wireless receiver—a crystal set—and a spark transmitter.

Marvin's parents had come from Russia. His father was a bookbinder. Neither of them shared his excitement about communication sets. But when Marvin was 16, he became a licensed radio amateur, opened station W9CSX (which he still has) and was elected president of his high-school radio club.

He wanted to study electrical engineering when he finished high school, but the year was 1934 and times were hard. So he clerked in a drugstore and took a few courses in mathematics and engineering in a school set up by the Federal Government to give work to unemployed teachers. Two and a half years later he entered what is now Illinois Institute of Technology.

A lucky break, Camras says now, led him into magnetic recording. His cousin wanted to be a singer and thought he'd get ahead faster if he could listen to his own voice. So he asked Marvin to help him build a recording machine.

His cousin had in mind a conventional disc device. But Marvin, who was then a junior in college, had been leafing through an old encyclopedia and had noticed a diagram in it of a Poulsen recorder. In 1898 a Danish engineer, Valdemar Poulsen, had magnetically recorded sounds on steel wire, but nothing much had ever been done about it.

RETURNING to their car after a day's hunting, Joe and Moe tossed their gear and red overalls into the trunk. As they were about to start out for home, Joe instead got out of the driver's seat, entered the back of the car, and yanked the back cushion out. A few minutes later all was well and he drove away.

...How Come?

ANSWER: All the car keys were in Joe's overalls and had been locked in the trunk. The only way to get them out was through the panel behind the rear seat of the car.

"How about trying one of these magnetized-wire machines?" Camras asked his cousin, and the ambitious young singer agreed.

Essentially, a magnetic recorder is a device for converting sound waves into magnetic impulses and then imposing them on wire or tape as a continuous series of tiny magnets. A five-minute recorded speech contains millions of these tiny magnets, varying in intensity just as the original sound waves varied. A piece of recorded wire or tape looks the same as a blank piece, but when it is fed back into the device, the magnetized spots are reconverted into electrical impulses and these, in turn, into sound.

The boys bought a pound of piano wire. They scrounged through the shops of second-hand appliance dealers till they found a one-hundredth - horsepower motor that had powered an electric fan. Gears and spools Camras turned on a bench lathe at school. For an amplifier and some other needed parts, the young inventor cannibalized his radio station.

Camras Squeezes in More Magnetism

By reading everything he could find on the subject and by experimenting, Camras discovered what had gone wrong with the original 1898 recorder. One grave fault was that the magnetic print of a single sound had been spread over a relatively long length of wire—as much as a tenth of an inch. For clear reproduction, therefore, the wire had to travel very fast, perhaps 10 feet a second, and a tremendous amount of wire had been needed. Camras solved that problem by developing a magnetic head that imprinted the sound in the space of a thousandth of an inch.

[Continued on page 250]

New Ideas
FROM THE INVENTORS

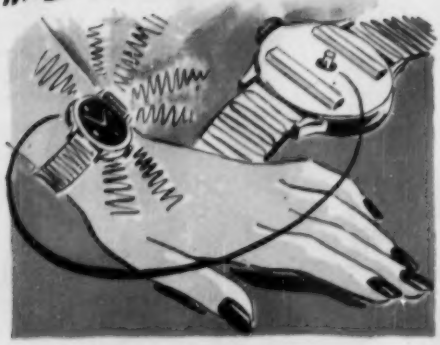
1 Stove to Defrost Ice Fishing. A frozen-lake fisherman could give more attention to his line and less to the ice chipper if he took a stove like this along. Straddling the fishing hole, the portable, charcoal-burning furnace would beam part of its heat downward to keep the hole from freezing up. Outfolded wings would also direct some warmth toward the angler, and he could use the grill top to heat coffee or cook a meal.

2 Chuck Key to Form Safety Switch. It wouldn't be easy to mislay this key or leave it in the chuck, because you couldn't start the drill until you had pressed the key into its own socket. The key-operated safety switch could be built into the body of the tool, or it could be made as a separate attachment and inserted in the line cord.

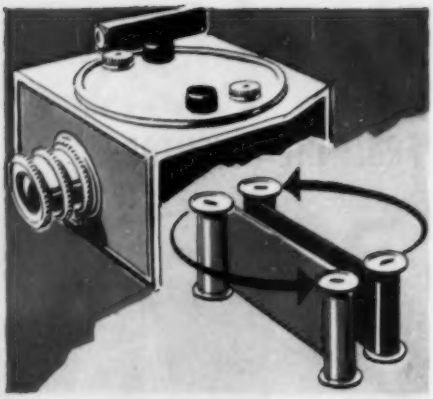
3 Tray to Crush Ice. People who prefer to cool drinks with ice chips rather than cubes usually have to hammer the little blocks into fragments. This refrigerator tray would do the job for them. Its built-in chippers, mounted on a central cam or screw thread, could be moved by a pivoted lever. Turning the lever would shatter the ice.

Please turn the page for more new ideas

MORE New Ideas from the Inventors



4 Alarm Watch to Prod Wearer. A bell alarm of the type used in some watches may embarrass the wearer if it sounds off in a church, classroom or other public place. And in a noisy area he may not hear it. To overcome such objections, this inventor would substitute a vibrating plunger for the bell. It would signal by tapping your wrist.



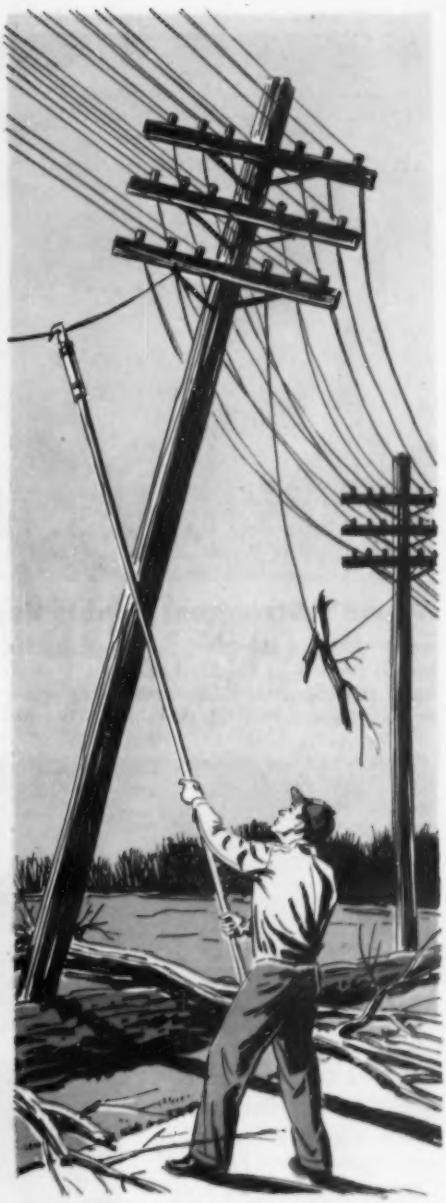
5 Camera to Switch Film. You could load both color and black-and-white film in this two-reel camera and move either one into register with the lens and shutter. The film carriers would be separated by light-tight seals to keep the exposure of one film from affecting the other and to permit the rolls to be changed independently.

6 Door to Hold Back-Up Light. Ordinary reverse lights often shine the wrong way when you have to back and turn at the same time. This back-up light would reveal obstructions or soft shoulders alongside as well as behind a car or truck. Mounted in a ball socket in the door frame, the lamp could be tilted up or down; moving the door would focus it sideways. The adjustable beam could light passengers in or out of a car, or illuminate street signs or house numbers out of range of head- or tail-lights.

U. S. patents on these inventions have been granted to: 1. G. Bryan, Minneapolis; 2. L. Griffin, Akron, Ohio; 3. A. Giordano, Arlington, Va.; 4. M. Marshall, Jackson Heights, N.Y.; 5. A. Incledon, St. Albans, N.Y.; 6. R. Kaiser, near New Middletown, Ohio; 7. A. Herring and K. Bauer, Philadelphia; 8. J. Sheets, Pasadena, Calif.; 9. G. Matthews, Detroit.

7 Tracer to Signal Near-Empty Can. When the contents of this squirt can changed color, you'd know it was time to get a new supply. A capsule of dye, under slight pressure, would be packed into the can. When the pressure of the ejector gas fell below that of the dye, the capsule would break and color the remaining contents.

8 Marker to Speed Traffic Check. As if parking tickets weren't easy enough to come by, this long-handled chalk holder would enable a mounted or motorcycle policeman to mark tires as he zipped through a block. When he checked back after the legal parking time had expired, however, he'd still have to write out the tickets.



9 Clippers to Fell Hot Wires. Storm-loosened power cables are usually left dangling until expert linemen can reach them. But with this bullet-powered extension cutter untrained workers could snip them safely. The cutter's claw would hook over a cable; a blank cartridge, triggered from handle, would ram a blade against it.

World's Strangest Bout Is Fought in Underwater Ring

No one can say that this novel boxing match put on in England was not a clean fight. It took place 15 feet below the water in the Empire Pool at Wembley. To complete a contest of two three-minute rounds, the boxer-swimmers spent about four hours under water, but were never submerged for more than a minute at a time.

Home Moves Along When Owner Travels

His engineering job keeps him on the move, but that presents no housing problem to James G. Mitchell. Runners under his house make it easy to load it on a big truck for transportation to a new home site.

Carpet Cleaning Is a Sidewalk Business

The scarcity of home vacuum cleaners in Frankfurt, Germany, has created a new curbside service for cleaning rugs and carpets. They are fed into one side of the strange-looking contraption shown at right. As the machinery inside beats and vacuums, the operator pulls them out at the other side, all nice and clean.

Hoeing, said Howard Ober, was no fit job for man or beast—and did something about it.

Big Business Grown from Strawberry Patch

By Harry Walton

MOST of us get nothing but blisters from hoeing a strawberry patch. But a 29-year-old engineering student doing that in 1936 also got an idea.

It was simply that a small engine should be able to swing a hoe much better than human biceps—a thought that had probably occurred to many other gardeners.

Howard C. Ober

What made Howard C. Ober of Newbury, Ohio, different from the rest was that he didn't forget it. He hung onto the notion and grappled with it for years. And now he has sold more than $2,000,000 worth of machines based on that idea.

Ober, a soft-spoken, round-faced man with a deceptively sleepy expression, didn't perfect his hoe overnight. More

BACK-YARD FARMERS were quick to welcome the machine this inventor couldn't forget—a power-driven hoe that walks as it works.

Attachments put the machine to work at many common chores

BESIDES CULTIVATING close to rows, the standard 2-hp. unit can till garden soil to a depth of four to six inches, ready for seeding. With attachments, it can plow snow to 16", saw cordwood, edge lawns, cut high grass, chop leaves, mow lawns and spray insecticides.

than once he was forced to turn away from it to earn a living, do war work, and even invent some other things that led him into blind alleys. But he always found his way back to his motorized hoe, and finally produced such a machine. He calls it a Roto-Hoe.

An Engineer at Heart

Although his father had hoped he would become a farmer, Ober preferred engineering. At Tri-State University in Angola, Ind., he majored in electrical and mechanical engineering. His first job was in the standardization department of General Electric's Nela Park division. There he calculated filament specifications for lamp bulbs. "It was a 20-inch slide-rule job," he recalls.

Possibly to lure him back to the farm, his father set aside a patch of ground for him in 1936. Ober put in a hundred dollars' worth of strawberry plants. Weeds grew faster than berries in the hard Newbury clay, and Ober found—as he had suspected all along—that at heart he was more of a gadgeteer than a farmer. Why not, he wondered, put blades or tines on a shaft which would revolve and both cultivate the soil and pull the machine? Could such a device be maneuverable and light enough to hop over strawberry runners without harming them?

In his first machine the tines were made of bolts with the ends hammered over to give them a hook shape. A six-tenths-horsepower engine from a washing machine was mounted on the frame. It didn't have enough power. "The thing stalled as soon as the tines hit the ground," Ober says.

His next engineering job took him to the coal mines in West Virginia. There he helped develop the use of Aerosol as a wetting agent to hold down coal dust. The strawberry patch was miles away, but he put a bigger engine on the hoe. It pulled the rotor around all right, but the bolts soon wore to stubs.

Ober then decided to try tines made

of cast malleable iron. He made a pattern for them, but two foundries refused to cast them. At a third, a young foreman named Dave Tuttle took pity on the inventor, and the castings were made. Tuttle is now a salesman for a nut-and-bolt manufacturer, and Ober is one of his steady customers.

A SMALL MODEL is designed to work close in and around flowers and shrubs. It has the same 2-hp. engine as the standard machine and powers similar attachments. Revolving in a horizontal plane at about 400 r.p.m., the cutter can be attached either in front or in back of the engine. Two guard disks alongside it protect plants.

Inventors Have to Eat, Too

In 1938 Ober took out his first patent on the hoe. The cast tines were better, but still too soft. It was also hard to keep them tight on the shaft. So Ober substituted a hexagonal shaft for his first round one, and made the tines with matching hexagonal holes.

By then Ober was married and had a family to support. "I've got to get money for the table," he told a friend. He took a job in a tool-and-die shop and stopped working on his power hoe. But somehow he found time to work out a couple of other inventions.

One was a coal saver that injected air through the fuel bed, another a thermostatic control that opened the check damper if the draft was left on too long. Ober made several of these in his basement and sold them to apartment-house owners. But he saw no future in them.

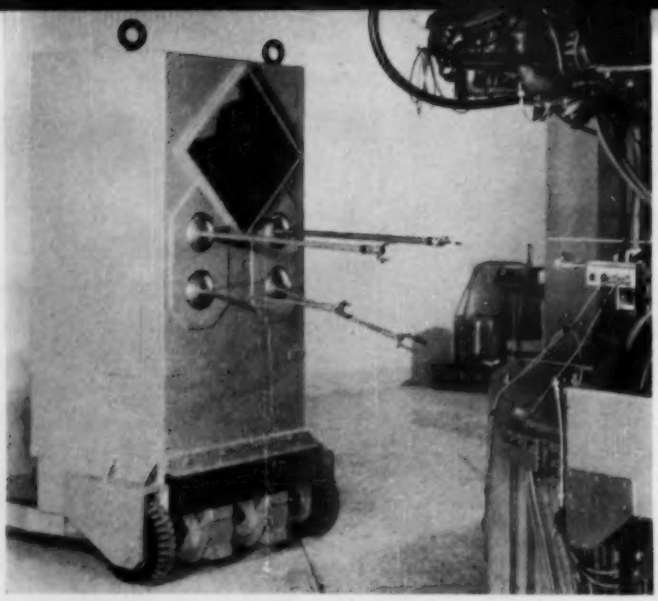
In 1940 he took a bold step. By increasing the mortgage on his home and selling a few savings bonds, he accumulated $5,000. With this and the machinery from his home workshop—two small drill presses, a 9″ lathe, a sheet-metal bending brake and a grinder—he made and sold a few hoes. Users liked them.

But along came World War II, and almost before he was in business Ober was out of it. Engine manufacturers could not sell him the midget power plants he needed.

He took his skills to the S.K. Wellman

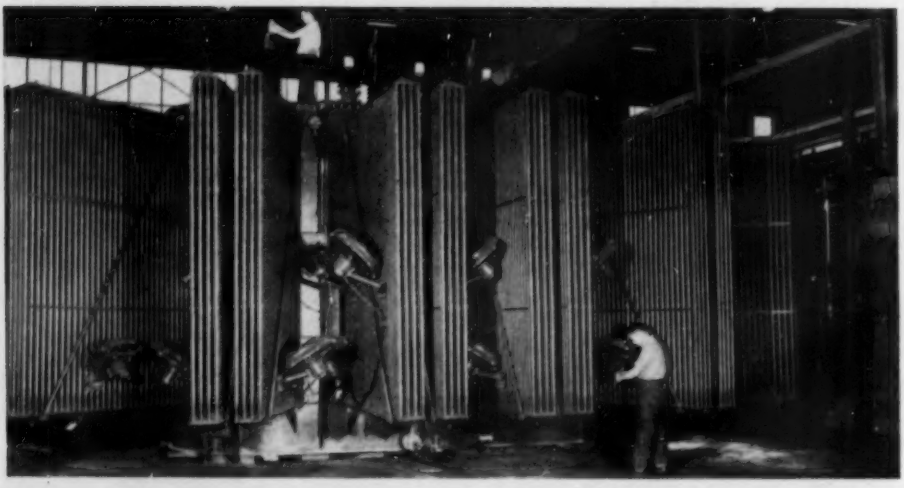
[*Continued on page 248*]

ODD JOBS COME EASY to the standard model. At left, it digs a trench. By removing loosened soil and going through again, trench can be made any reasonable depth. Center, it turns over and loosens a compost pile. Right, it stirs poultry-house litter. Other attachments can convert the unit for spraying paint, pumping water or other fluids, generating up to 880 watts of electricity, and (with special cutting disks) aerating hard-packed lawns.



One-Man Tank Guards Worker From Hot Rays

SAFE behind the four-inch-thick lead walls of this "cyclomobile," an Argonne National Laboratory scientist is able to approach the cyclotron and manipulate four tongs to grasp and remove a target that has been made "hot" by a bombardment of nuclear particles. The diamond-shaped window of the electric-powered car is made of lead glass.



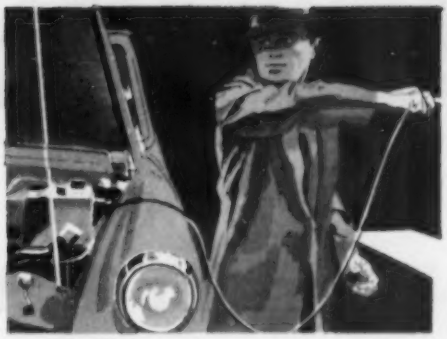
Fans Cool Giant Transformer

WHAT looks like a stage set above, is really the cooling system for a 196-ton power transformer, biggest ever built by General Electric, with a capacity to supply electricity to 500,000 homes. The cooling job is done by 23 big radiators and 46 fans.

Radio Controls Model Drydock

A SUBCHASER is high and dry for repairs in this miniature dock that rises and sinks at a signal from the hand-held radio transmitter. It was exhibited by M. Monseur at a recent model contest in Paris.

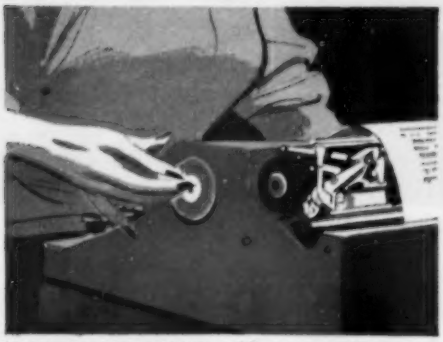
I'd Like to see them make...



A CAR STARTER that would work on six volts DC in the usual way or on 110 volts AC. Then you could plug into house current for cold-weather starting.—*W. E. Hall, Medford, Ore.*

AN ILLUMINATED LEVEL for working in dark corners. There's plenty of room for a tiny flashlight bulb and battery in the frame.—*Charles T. Pike, Embarrass, Minn.*

PLASTIC MEDICINE DROPPERS scaled in fractions of a teaspoon. They'd be easier to use than a spoon when dosing small children and babies. —*Pat Denton, Grand Haven, Mich.*



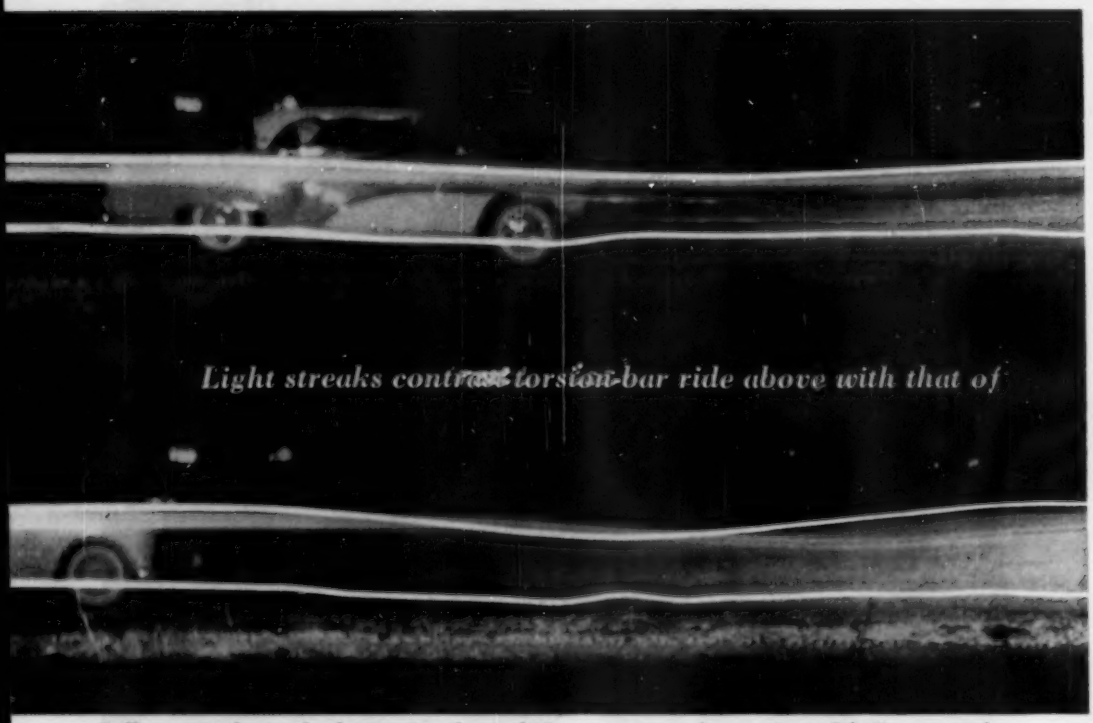
A TYPEWRITER ERASER with a magnet on one side of the metal center disk so it would stick to the side of a typewriter.—*Pearl E. Fitzpatrick, Gary, Ind.*

AN ELECTRIC TOASTER that would open down the middle to serve as a hot plate for brewing coffee, frying eggs or heating the porridge. —*R. J. Dymsa, West Lafayette, Ind.*

Everyone has his own pet idea of a gadget that he would like to see in general use. The five ideas illustrated above were suggested by POPULAR SCIENCE MONTHLY readers. What is *yours?* We will pay $5 for each one published. Please use Government postcards only. Write name and address clearly. Contributions cannot be acknowledged or returned.

PACKARD NAME is reserved for the big prestige cars like one at left. Clippers come in three series on shorter (122 in.) wheelbase. Torsion bars and big V-8 are optional on the top Clipper.

'55 Packard Glides on Torsion-Bar Suspension



Bulb mounted on wheel nut gives lower light trace on each car. Second bulb mounted

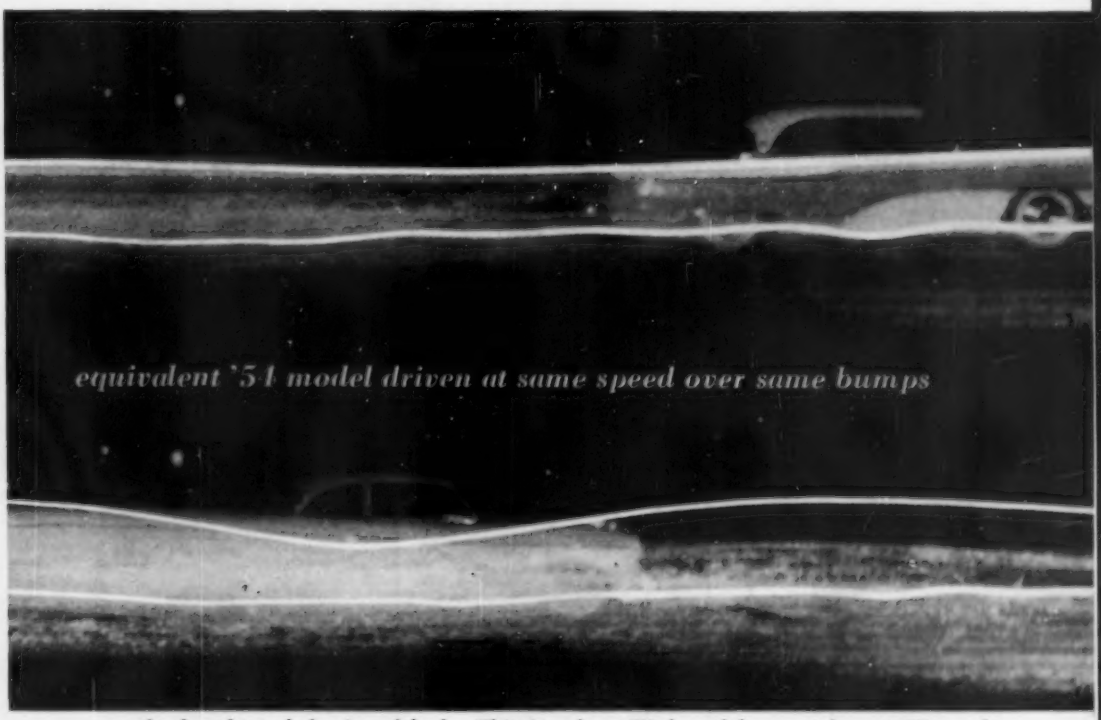
LOAD COMPENSATOR is demonstrated by having two people stand on back bumper (below left). For six seconds, car sags almost to limit. Then a geared electric motor winds up the leveling torsion bars and back of car comes up to design height (center) despite load. Back rises up extra high, right, when load is removed but after six seconds car returns to exact level.

By Frank Rowsome Jr.
PHOTOS BY HUBERT LUCKETT

THERE'S plenty of solid news this year from Packard, enough to make up for the lean years. Highlights:

- A radically different suspension that does away with coil and leaf springs, and that combines two hitherto irreconcilables—soft riding and stable handling.
- A slick mechanism that automatically levels the car fore-and-aft, and that largely eliminates "bottoming."
- A pair of brand-new V-8s, brimming with torque and power.
- A redesigned automatic transmission, to provide gear-assisted starts for gee-whillickers getaway.
- And a sheaf of such other developments as a 12-volt electrical system, wrap-around glass, fancy styling, and interiors of sufficient lushness for the transport of a 24-carat maharajah.

The new suspension, which can be best described by the seat of the pants, is a fascinating mechanism. For compar-



on fender charts behavior of body. This is a long W-shaped bump, taken at 35 m.p.h.

HEAVY BRAKING makes any car droop its snoot, but new suspension tames the tendency, as the sequence pictures below reveal. Both of the cars were going at same speed, with last year's model a half-length ahead, when brakes were jammed on hard. Older car shows a pronounced dive. New one lowers in front but does not rise as high in back, thanks to torque arms.

New suspension gives far less squat on getaway

Sequence camera reveals how old and new compare on full-throttle acceleration. In the third frame, '54 car is almost dragging its rear bumper.

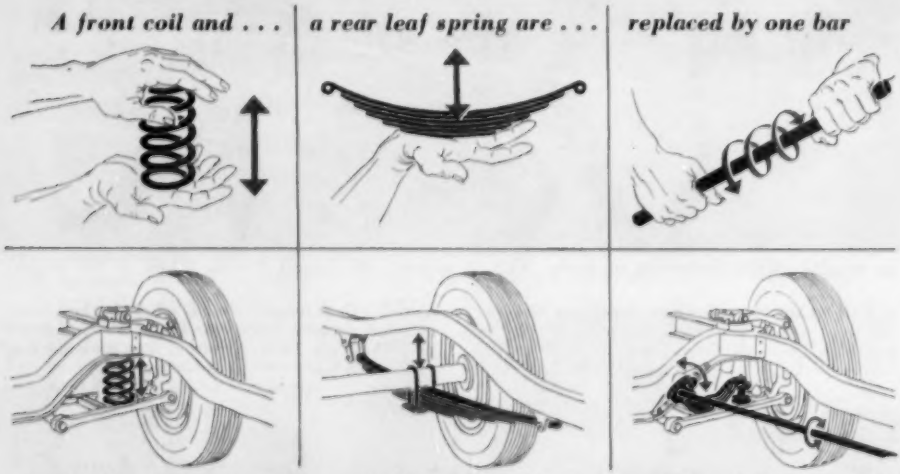
ison, PSM photographer Hubert Luckett and I first tooled a '54 Clipper over the mean back roads at the Packard proving ground. Like all Packards, the '54 gave a smooth, rather soft ride. But even though it was only moderately loaded, it proved willing to hit bottom when mildly provoked.

If you drove roughly, the '54 also showed a marked tendency toward diving when you belted the brake, and squatting when you tromped on the gas. Like the rest of the breed it still behaved in a gentlemanly fashion—who but a cad is going to flail a Packard?—but you were aware of the penalty paid for the softness of the ride.

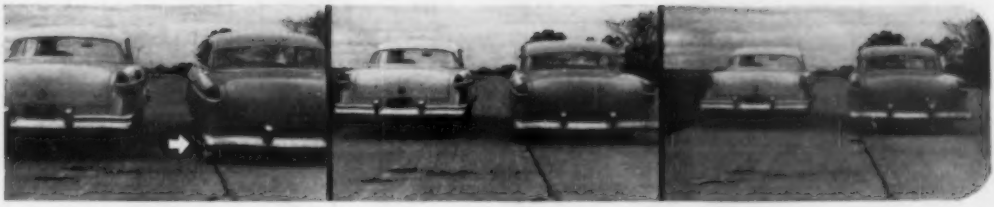
Then Lucky and I tried the same roads, at the same speeds, in a '55 Clipper with the new torsion-bar suspension. The ride was fully as soft, maybe even softer. The car simply swallowed up bumps, the way a foam-rubber pad would swallow up surface inequalities of a piece of sandpaper.

Remarkably, however, there was no penalty for the absorbent-cotton ride. The car did *not* bottom on entering deep dips taken fast, and it did *not* rebound like a frightened gazelle on leaving them. On washboard surfaces, there was no balletlike wheel skitter. Best of all, the body showed a fine indifference to how you played the pedals; dive and squat could still be detected, but were tamed to insignificance. With torsion bars, the Packard personality changes from a dowager's to that of an able road car.

The problem. In quality cars these days the big thing is a "boulevard ride." It has been classically achieved by softening the springs, letting chassis and body weight creep upward and searching



FAVORITE U.S. SUSPENSION has been coil springs in front, leaf springs in back, with rear ones also transmitting torque loads to frame. In new Packard, where a single torsion bar per side replaces both springs, front-end design is roughly the same but lever arm substitutes for the coil. In rear, another lever presses against stirrup in torque arm running from axle to frame. The

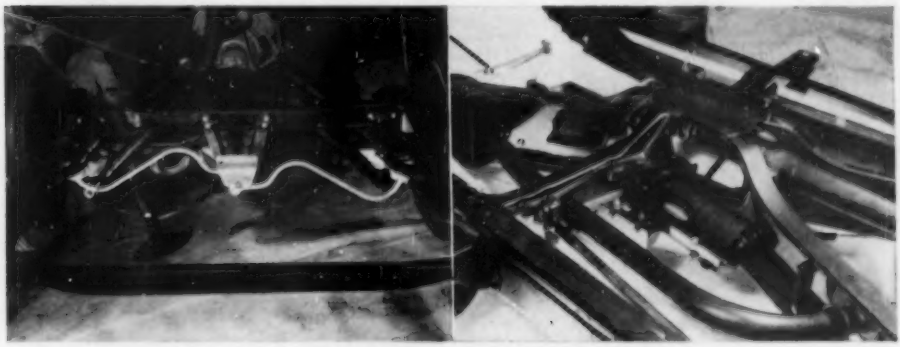


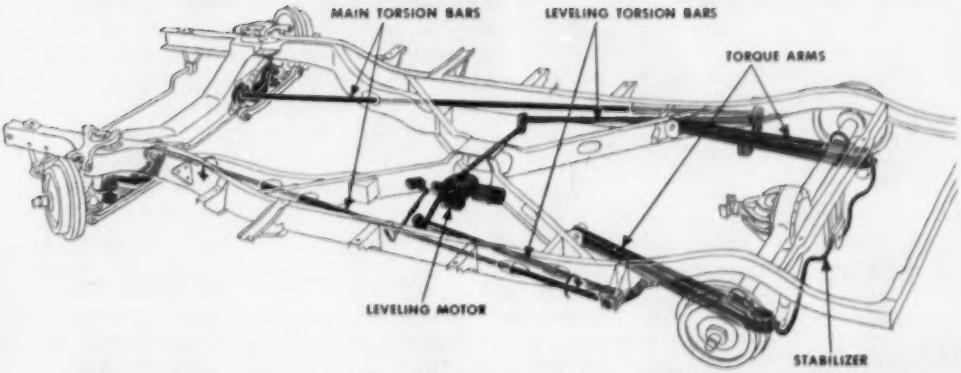
for shock-absorber valving that will tolerate such soft springs.

If you want to be shown, walk along a row of parked cars until you come to any expensive sedan built in the last few years. Put one foot on the bumper, in the manner of a small-town philosopher, and press lightly. The big boat will sink under your foot like a little canoe, revealing by its sponginess the degree of recent spring softening.

This hurts in some ways, of course. Such a car is a slave to its shock absorbers, and leaps like an antelope when the shocks grow weary. Loaded, it tends to bottom repeatedly on the rear-axle housing. It has a wide height range, riding high like a barely ballasted tanker when only the driver is aboard, but running almost awash with a full load. Worst of all, it can display soggy or ill-tempered handling characteristics at high speed or on turns.

The treatment. Packard's torsion-bar

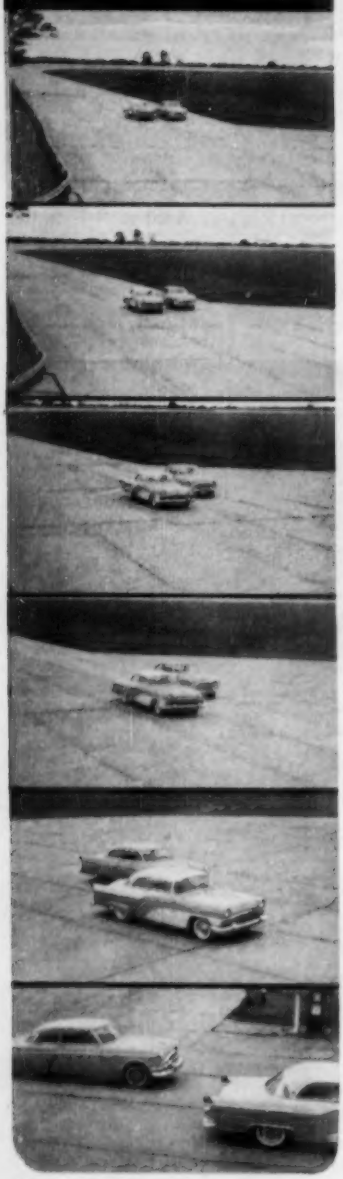




two torque arms take over the job of delivering rear-axle thrust, as well as brake torque and drag, to chassis. Pretzel-shaped bar in left photo above is stabilizer that ties axle against sideways movement. Heavily geared-down motor that winds up the ends of the leveling bars is shown in the right photograph above. It runs only when the car load changes.

Getaway race puts new car far out in front

In full-throttle start, '55 car leads by more than one length in three seconds. Gear-start automatic box aids new V-8.

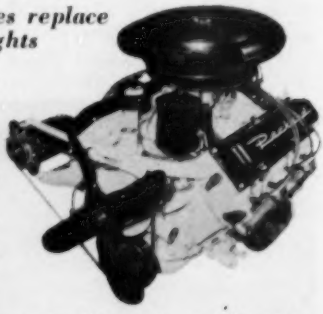


suspension tries a fresh approach. In place of coil and leaf springs the car uses two alloy-steel bars, about nine feet long and one inch in diameter, that lie roughly fore-and-aft along the frame side rails. The bar at each side serves as the spring for both front and rear wheels on that side.

Cranklike arms are secured to each end of the bar, to transmit the rotation that constitutes a torsion bar's springiness. Except at the ends, the bar floats free—there is an antivibration rubber collar in the middle—and the only loading it has is what is put in at the ends. The bar does *not* expend its twist on the frame.

How can chassis weight over the left wheels, say, provide *opposed* twist to the left bar? Plainly it wouldn't do any good to twist both ends of a free bar in the same direction. The answer, of course, is that the arms at the ends are fitted to the bar in opposite directions, roughly 180 degrees apart.

Big new V-8 engines replace the old straight eights



Rated at 260 hp., this brute has bigger displacement than any current U.S. passenger-car mill. It has oversquare proportions, "parabolic" combustion chamber, overhead valves, and four-barrel carb. In the de luxe Caribbean, hp. is boosted to 275.

This means, among other things, that a force exerted on one end of the bar, as when the front wheel is deflected upward by a bump, does not get telegraphed to the frame as torsion. The force that whangs the front wheel up is simply spent in loading the rear wheel down. (More precisely, it is spent in winding up the torsion bar, but the reaction is mainly against the road in back.) The chassis and body just come along for the ride.

One way to visualize this is to imagine that you are a bulgy-muscled giant. Tilt a Packard so that the weight rests on the two wheels on one side. Then extend your arms out to touch both uplifted wheels and watch how, when you push the front wheel up, the back one goes down, and vice versa. (Incidentally, if you *are* a giant, and try this, you'll find that the torsion bar is preloaded—that it is "wound up" on installation, to balance out the chassis and body load at design height.)

[*Continued on page 268*]

Jet-Propelled Pumper Floats to Fires

TURN in a fire alarm near a river in an English village and three pumps on a raft may turn up to put out the blaze.

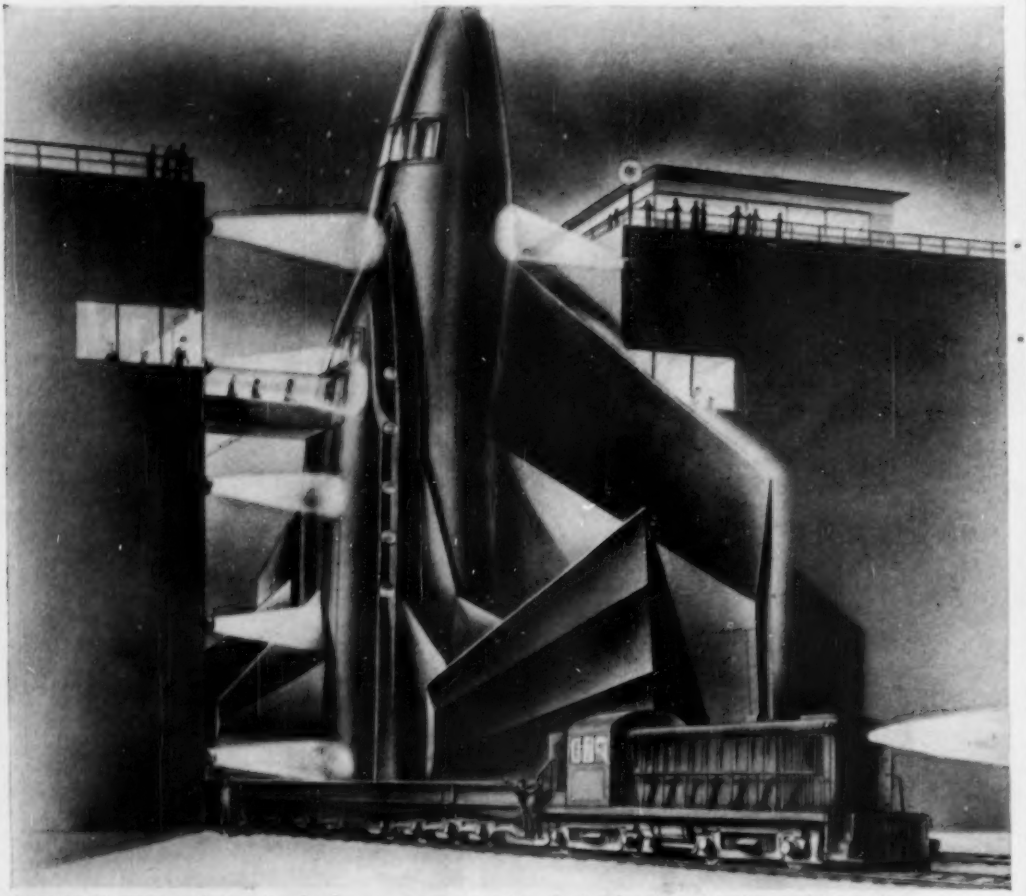
British auxiliary firemen serving waterside communities are trying out inflatable rafts that can be trucked to a launching spot and lowered by crane. Once afloat, the raft heads for the fire, propelled by a jet of water from one of its pumps. Together, the three pumps throw 1,000 gallons a minute through a half-mile-long hose.

Slot Machine Collects Toll

MECHANICAL collectors pick up tolls to feed cars through faster at the Union Plaza booth on New Jersey's Garden State Parkway. Drop a quarter in the box and a light flashes green up ahead to signal that the automatic toll booth has collected its fee.

Ignition Needs No Waterproofing

A NEW Dutch ignition system kept this jeep engine chugging through the hosing above. The ignition was not waterproofed. In other tests by the Navy and Marines, the low-voltage system kept spark plugs firing even when they were coated with ice.



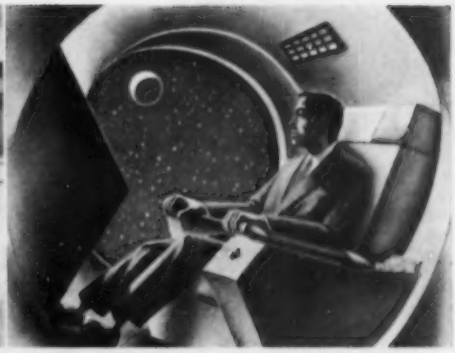
1 **BOOSTER UNIT** and its piggyback passenger ship would stand in nose-up, rocket take-off position during loading. A train would tow the 300-ton combo to the launching site.

Rocket Liner Would Skirt Space to Speed Air Travel

DESTINATION Earth is a new twist in passenger-carrying spaceships. Spanning the U.S. or the Atlantic would take an hour and a quarter, the Pacific an hour and a half. A piggyback ride on a booster rocket would start this superliner of tomorrow on a fantastic flight to an altitude of 200,000 feet and a brief top speed of 17,500 miles an hour, 24 times the speed of sound.

How this high-speed, globe-girdling air travel would be accomplished is shown in these drawings. They are based on design proposals of a Bell Aircraft Corp. scientist, Dr. Walter R. Dornberger, who worked on German V-2 rockets.

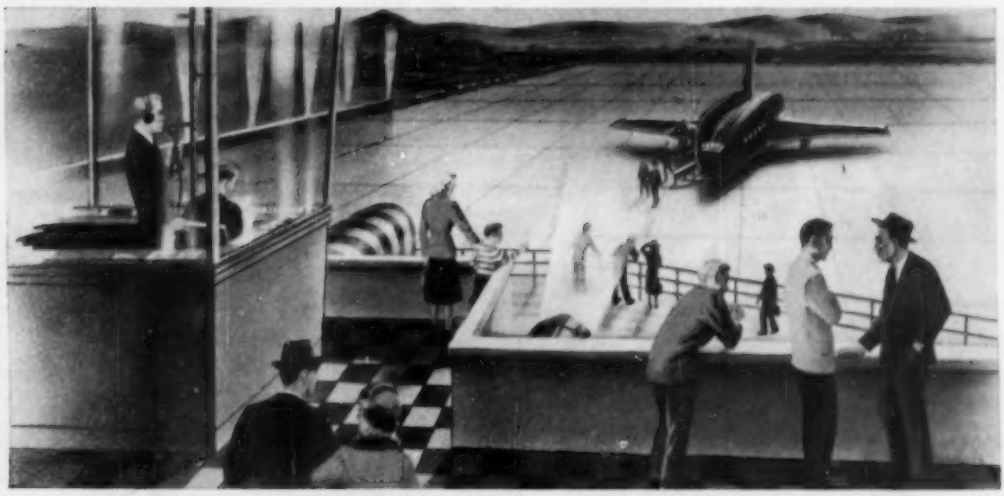
2 LAUNCHING would be from the center of a heat-resistant pit, with eight rocket motors blasting off with a thrust of 760,000 pounds. Both booster and plane units are crew-manned.



3 DURING TAKE-OFF, passenger seats would be one above the other on each side of an aisle. They would rotate on a horizontal axis when the ship leveled off in flight.

4 TWO MINUTES LATER, at an altitude of 70,000 feet, the passenger rocket would blast itself free from the booster, as the latter cut its rockets and glided back to base.

5 PASSENGER PLANE'S ROCKETS would blast it spaceward for about two minutes, then be cut. Silently it would continue to climb, then lose speed and glide back to earth.

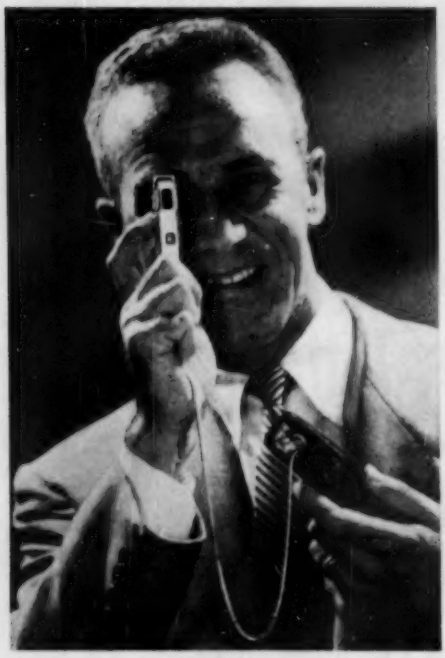


6 SUPERSONIC SPACE-BRUSHING FLIGHT would end in a gentle glide through the lower atmosphere, landing on a runway in the manner of a conventional airplane.

A midget midget, this 16-mm. camera fits over glasses to snap what your eye sees through the lowered view finder. It has an f/5.6 lens and a shutter speed of 1/30 of a second. Bruno Otto, Baaderstrasse 20, Nuremberg, sells this Colibri II in Germany for about $3.50.

Photo News

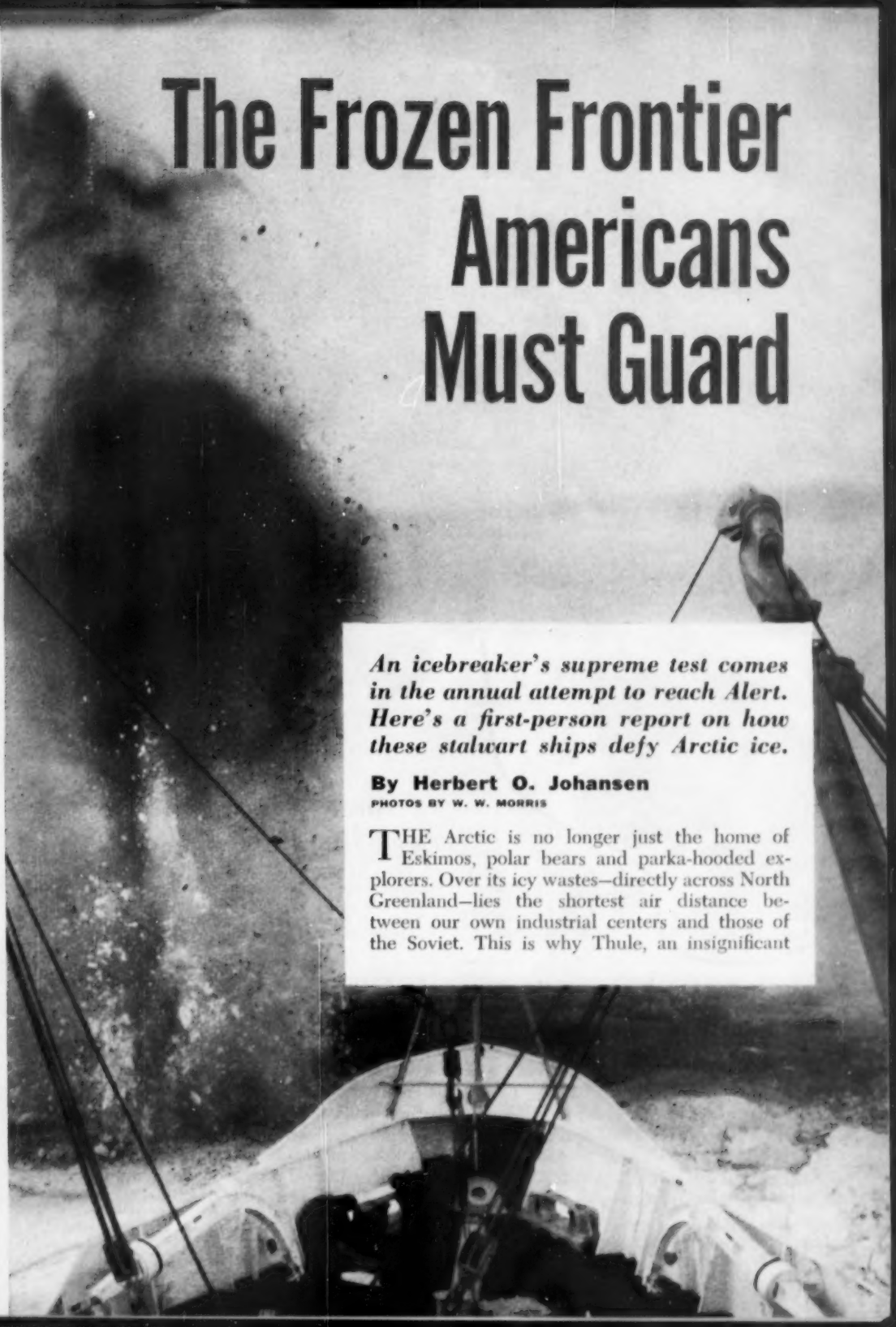
A gold-plated camera no bigger than your cigarette lighter, the Minox (below) was designed originally for espionage work. It has an f/3.5 lens and makes with 11 shutter speeds from ½ to 1/1,000 of a second. It also features built-in green and orange filters. The Kling Photo Corp., 235 Fourth Ave., NYC, will send you one for $300.



Color close-ups, needle-sharp and perfectly lighted, are easy with a new Eastman kit for the Kodak Pony camera. A lens attachment and metal L set focus and framing; a flash cover controls lighting.

A 3-D box-camera outfit includes a modernized version of the old stereopticon (below) for viewing. The camera is two units that can be taken off the mounting bar and used separately. Sears, Roebuck sells it.

The Frozen Frontier Americans Must Guard



An icebreaker's supreme test comes in the annual attempt to reach Alert. Here's a first-person report on how these stalwart ships defy Arctic ice.

By Herbert O. Johansen

PHOTOS BY W. W. MORRIS

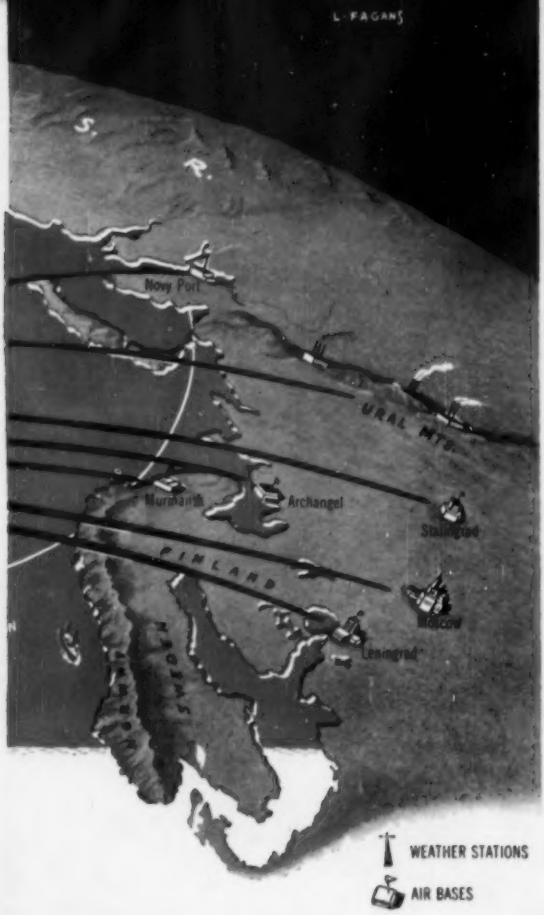
THE Arctic is no longer just the home of Eskimos, polar bears and parka-hooded explorers. Over its icy wastes—directly across North Greenland—lies the shortest air distance between our own industrial centers and those of the Soviet. This is why Thule, an insignificant

This is the top of the world,

It takes a polar projection map like this to show that the shortest air distances between vital centers of the West and East lie over the icy Arctic waste. This short-cut route is why we are building up our strength at Thule Air Base in Northern Greenland. It is why Russia has built military installations on Franz Josef Land, an

Eskimo village only a few years ago, has become important in the strategic air picture. The shortest distance from Chicago to Moscow is via Thule. From Thule it is only 2,000 miles to Moscow and Russia's vital war plants behind the Urals. The Soviet Union's guided-missile centers on the Arctic Ocean and the Baltic are even closer.

When William W. Morris, chief photographer of POPULAR SCIENCE MONTHLY, and I left Boston last summer on the Navy icebreaker USS *Atka*, neither of us knew any more about ice than you can learn while jiggling stubborn cubes out of refrigerator trays. But when we returned we talked knowingly about slush ice, brash ice and block ice;



strategic hub of the jet age

hour's jet flight from Greenland; why she has concentrated her air power and guided-missile sites along the Polar Sea. It is why we need icebreakers, like the new U.S. Navy *Glacier*, to keep open supply-ship lanes through the frozen waters of our Arctic frontier, where ice must be mastered to maintain our defenses.

puddle ice, rotten ice and polar ice; ice that is ridged, rafted and hummocked; about icebergs, floebergs and growlers.

We learned on that trip—a trip that many more Americans must make in the years to come if our Arctic ramparts are to be secure—that the polar icecaps extend for some 5,000,000 square miles. Greenland's icecap alone is more than two and a half times as vast as Texas. It covers more than 700,000 square miles of the island's 840,000 square miles, and some of it is more than 1,800 feet thick.

Our first glimpse of Greenland came when we passed Disko Island. Rugged, forbidding, clifflike mountains rose straight up from the waters of Baffin Bay. Their tops were covered with snow, and heavy snow nestled in the valleys that ran down to the sea. Or so I thought until Eric Fry, a fellow voyager, enlightened me.

What I thought was snow stretching far back over the tops of the mountains was the Greenland icecap, he explained. The snow-filled valleys were glaciers that had calved the icebergs floating around us, brilliant white in the blue water.

Mr. Fry is a tall, thin Canadian. His long, narrow face is furrowed and weathered from more than 30 years of exploring and surveying in the Northwest Territories above the Arctic Circle. He was on his way to the U.S.-Canadian weather station Alert, as a representative of the Canadian Department of Mines and Technical Surveys.

Baby Bergs Are White

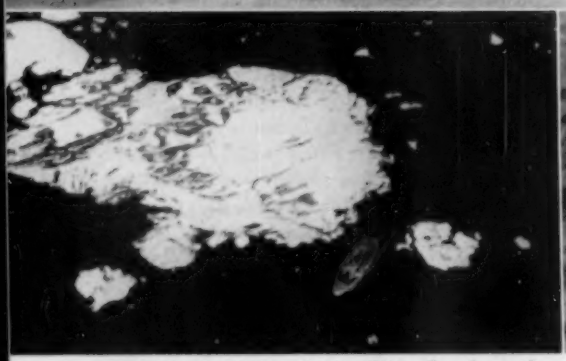
Mr. Fry pointed out to me why certain icebergs appear pure white. They are newly calved ones, he explained, consisting of snow containing quite a bit of air. Others have a bluish color. In these the snow has been further packed by the wind and weather and the compacted snow has congealed to a more icy solid.

When I started to focus my camera at Disko Island, Mr. Fry advised me to save my film until we reached real iceberg country up in the Devil's Playground. Those we were already among, he explained, were mere babies, only 50 to 75 feet high. Recalling that only about a seventh of an iceberg shows above water, I thought, "Some babies!"

The next morning, however, I was glad I had saved my film. We had advanced into a nightmare dreamland of towering icebergs. There were soft, white bergs;

[Text continued on page 168; more icebreaking photos on next two pages]

Pack ice gives shivering photographers a precarious platform



ON ITS WAY TO ALERT, 450 miles from the North Pole, the U.S. Coast Guard *Eastwind* picks a path through "leads" (channels) between ice floes. She is headed for heavy ice.

A HERD OF WALRUSES crosses our icebreaker's path in Smith Sound. Since the animals rarely go far away from ice, they are a good sign that the icebreaker soon will be going to work.

ICEBREAKER KNIFES THROUGH as a crack is opened in the solid barrier ahead. An expert ice navigator also takes advantage of natural leads and openings in the pack.

TRAIL OF OPEN WATER left by an icebreaker can be navigated by ordinary, thin-hulled ships. They must follow in close order, however, so that the ice does not crowd in again.

CLOSE FRAMING of the hull is shown in this view of the *Glacier* under construction.

hard, glistening icy ones, tinted with varying shades of blue and green.

They would drift north with the current, then head across Baffin Bay to the Canadian side and head south. Some of them will arrive in the North Atlantic this summer, some not until next year, melting and rotten midgets, but still a mortal threat to thin-hulled ships.

"You'd think," said Mr. Fry, "that those towering icebergs would be swept swiftly along with the wind, which would have little effect on low ice floes. But just the opposite is true. Flat ice is at the whim of the winds. The icebergs, on the other hand, because so much of them is under water, are impervious to the wind. It is the slow, often tortuous, currents that carry them along to their final destination and disintegration."

This time, when I brought out my camera, Mr. Fry raised no objections. He had his own camera in action.

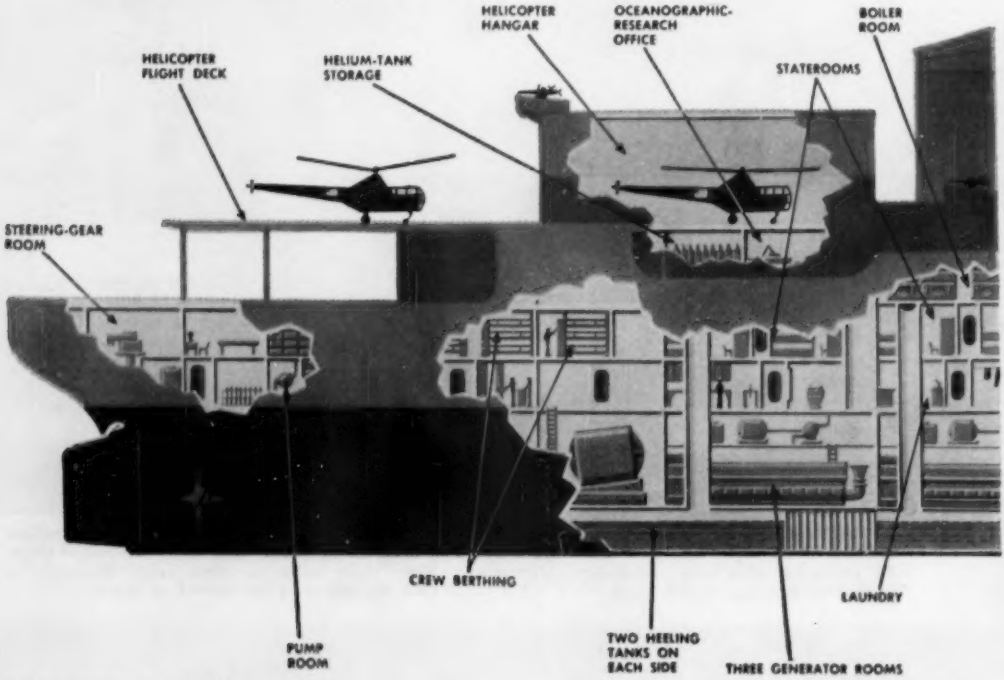
Ice Pack Wears a Halo

"Have you noticed the ice blink?" he asked, after we had been climbing all over the *Atka* on our snapshot safari. I looked at him, puzzled.

"Ah, I'm sorry," he apologized. "I forgot that the Arctic is new to you." He pointed to the northeast. "See that bright halo of light out there?"

I looked, and did see a brightness.

"That's caused by the reflection of light on ice. It's called the ice blink. When an ice sailor sees it, he knows that he is



headed for an ice pack. We should be there in a couple of hours."

In retrospect, the ice we saw that day was not impressive. It was slush and puddle ice. A few days later I left the *Atka* to board the U.S. Coast Guard's *Eastwind*, which was scheduled to proceed to the northernmost land weather station in the world, a tiny cluster of shacks known as Alert. Once a year an icebreaker tries to reach Alert with supplies and personnel replacements.

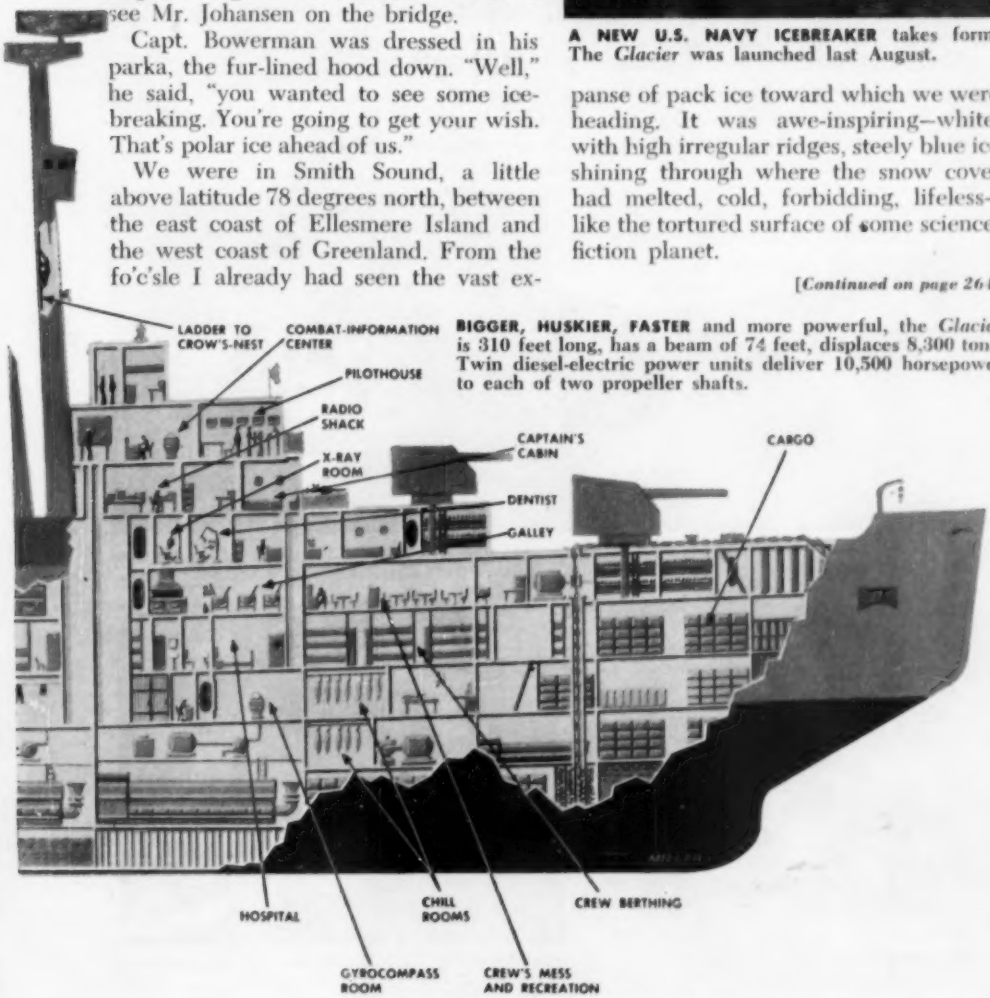
On Wednesday morning, August 4, the *Eastwind's* loudspeakers bellowed that Capt. George H. Bowerman wanted to see Mr. Johansen on the bridge.

Capt. Bowerman was dressed in his parka, the fur-lined hood down. "Well," he said, "you wanted to see some icebreaking. You're going to get your wish. That's polar ice ahead of us."

We were in Smith Sound, a little above latitude 78 degrees north, between the east coast of Ellesmere Island and the west coast of Greenland. From the fo'c'sle I already had seen the vast expanse of pack ice toward which we were heading. It was awe-inspiring—white, with high irregular ridges, steely blue ice shining through where the snow cover had melted, cold, forbidding, lifeless—like the tortured surface of some science-fiction planet.

[*Continued on page 264*]

A NEW U.S. NAVY ICEBREAKER takes form. The *Glacier* was launched last August.



BIGGER, HUSKIER, FASTER and more powerful, the *Glacier* is 310 feet long, has a beam of 74 feet, displaces 8,300 tons. Twin diesel-electric power units deliver 10,500 horsepower to each of two propeller shafts.

Please turn the page for Mr. Fry's adventures

Mr. Fry Finds Letter Lost Since 1876

MR. ERIC FRY, veteran of the Arctic and Canadian representative on the icebreaker *Eastwind*, wanted to be put ashore at Cape Isabella, Ellesmere Island. His objective: to take sun observations so that inaccurate Arctic charts can be corrected.

Mr. Fry got more than he bargained for, as is seen in these photos. Stranded on top of a 700-foot mountain, he had to be rescued by mountain-climbing crewmen. While waiting, he uncovered a rusty metal cylinder. In it was a yellowed letter left 79 years ago by an English explorer, telling another explorer that he was leaving dispatches for him in a cairn on another island.

P.S. Mr. Fry's Cape Isabella sun observations were dandies.

PARKA-CLAD MR. FRY boards the *Eastwind's* copter for hop to mountain at Cape Isabella.

SET DOWN on this mountain top, Fry is marooned when helicopter breaks down.

DISABLED HELICOPTER is towed back to the icebreaker by a Greenland motor cruiser.

RESCUE SQUAD of husky seamen convoys Fry (carrying ice ax) to base of the mountain.

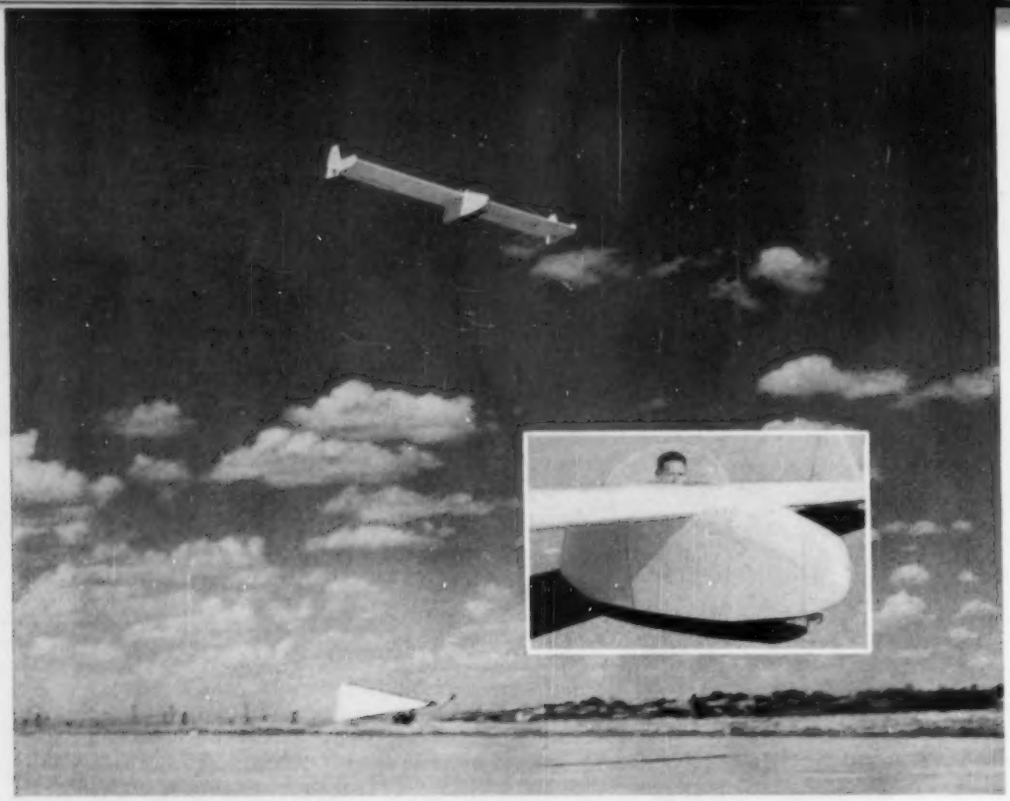
CAIRN FIND, a link with the past, is examined by Mr. Fry and Capt. Bowerman. END

Pro Coaches Lens Fans at Water Show

BEAUTIFUL girls, colorful settings and lots of action make Florida's Cypress Gardens a photographer's paradise. To top the cake, there's a special stand for shutterbugs (left) with a pro on hand to advise amateurs. He makes frequent light checks and, from a control box, sets two overhead meters that give exposure readings for color and black-and-white shots. Even movie makers get help. They're told when to start shooting and are reminded to let the action go out of a frame for a view of open water before filming the next action.

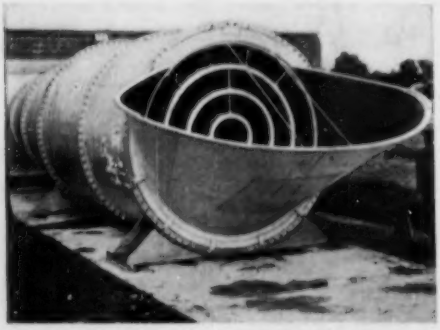
Solar Stove Saves Up Heat After Dark

THAT's a sun-cooked hamburger that Dr. Maria Telkes, a solar-energy scientist, is sampling at right. Four flat mirrors, cheaper than parabolic ones hitherto used, reflect heat into the heavily insulated triangular box, which contains a cooking tray surrounded by heat-storing chemical salts. The stove reaches 300°, holds cooking heat for about an hour, and has been developed for use in India and Near East. In quantity it may cost only about $5.



Texas Engineer Designs "Flying Plank" Tailless Glider

BUILT from odds and ends, a tailless glider with rudders on the wing tips has been flown successfully in Texas. It is only seven feet nine inches long but has a wing span of 26½ feet. The cockpit, shown in the photo inset above, is a tight fit. The aircraft was designed by Al Backstrom, Chance Vought structures engineer.



Muffler Smothers Jet's Roar

TO REDUCE the roar of a jet-aircraft engine running at full throttle, a British manufacturer, Vickers-Armstrong, inserts the tailpipe in a muffler. It is so effective that at a distance of 1,000 yards the noise level is so reduced that it causes no annoyance.

Twin Truck Scales Weigh Plane

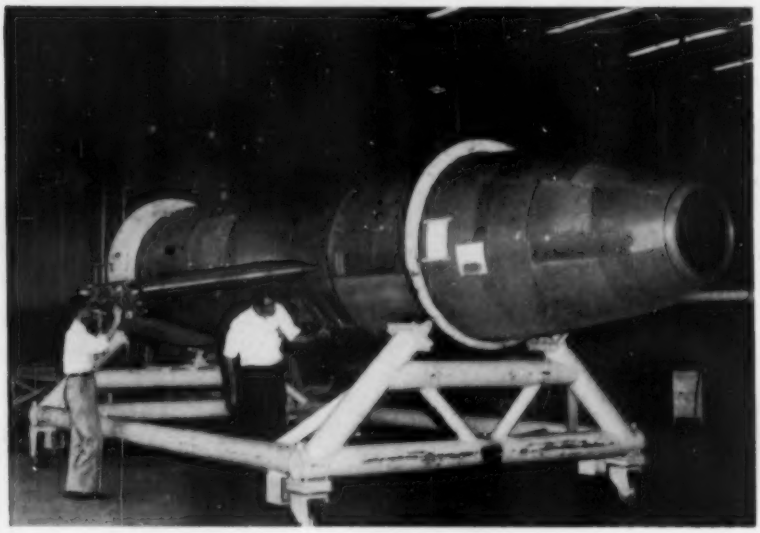
TO FIND out how the center of gravity of an airplane changes as fuel is consumed, a Texas laboratory uses two 30-ton motor-truck scales hooked together. Hydraulic elevators simulate climbs, dives and straightaway level flight.

Tanker Plane Soaks Bomber In "Rainstorm"

THE flying-tank car —used to refuel bombers—has been given another job in Kansas. It douses bombers with simulated rain to determine how effective experimental devices are for removing rain from airplane windshields. Water streams from a hose in a boom that usually spews gas.

Boeing is trying out rain deflectors, heated air blasts and chemical water repellents on B-47's. Customarily, airplanes use the same kind of arm-type wipers as cars.

▶▶▶British Bristol Freighter planes recently crossed the English Channel 222 times in a day to rack up a landing or take-off every 89 seconds.



Whirligig Shakes Out Guided Missile

THE guided missile Regulus goes through one manufacturing process that nobody would dream of—it gets rolled over by a motor in a big jig.

There's a reason. As the cigar-shaped weapon is made, little pieces of metal collect in corners where a vacuum cleaner can't get at them. So, before the missile's engine is installed, the engineers let gravity remove the debris.

AUTO LAUNDERING is 30 years old. Slow handwork (left) has been replaced by mechanical washers (right) that make your car sparkle while you loll in the shade.

They Wash Two Cars a Minute

BACK in 1945 a Detroit businessman named L. J. Rousseau got irritated one day by delays while he was having his car washed. He decided that the only way he could get his car cleaned efficiently was to invent a production-line mechanical system to do it.

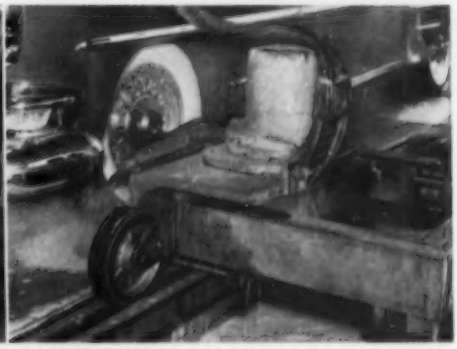
Today a million family cars throughout the country are being laundered every weekend at scrubbing stations that embody Rousseau's ideas. Most of them complete a car a minute. Some can do it in as little as 30 seconds. The up-to-date auto laundry is a group of machines that squirt detergents, warm water and steam over the body and wheels, then bathe the car in gales of dry air. Human hands hit only a few licks to help out the machines. An electric-powered endless belt (inset), with an automatic safety feature to prevent a pile-up, keeps the cars moving.

Heart of any of the several systems in use at 1,400 laundries is a series of big, non-scratching brushes that swab off the dirt in seconds.

1 CLEANING JOB starts with attendant vacuuming interior, emptying ash trays. This plant can turn out two cars a minute.

4 WIELDING SOFT FLEECES, workmen spread soapy solution over body and top. Two rinses in next 30 feet remove this for drying step.

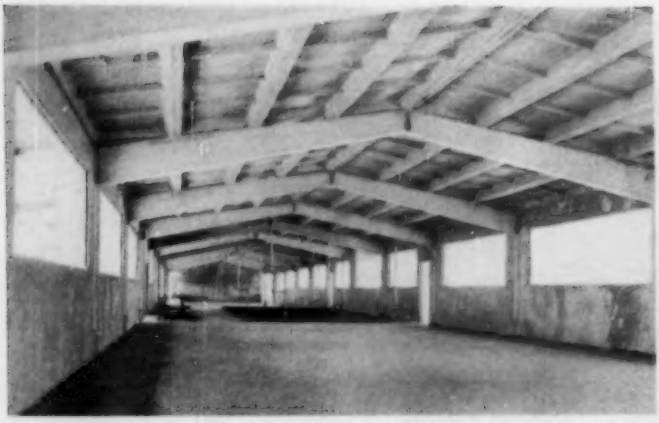
2 TOW CHAIN is hooked to endless belt, driven by variable-speed electric motor, to pull car through 110-foot cleaning cycle.



3 NYLON BRUSHES turning at 150 r.p.m. clean tires with detergent and hot water. Dirty water empties into tank in foreground.

5 JETS SPRAY soft water on top, sides. Top spray can be cut off when a convertible goes through to prevent soaking upholstery.

6 WASHED AND DRIED, car emerges from laundry. If a pile-up threatens, a shear pin snaps when lead car touches post at end.



BUILDING IN REVERSE gets two barracks like this one completed every 24 hours. When finished with partitions, windows and air conditioning, each barracks will house 96 Leathernecks in the Marines' biggest Stateside camp.

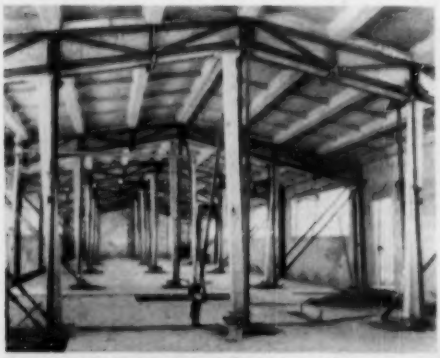
Backwards Building Makes Barracks Cheaper

WALL SLABS GO UP FIRST. Cast on floor, they are tilted into position and held there by shoring. Entire camp will cost $13,000,000.

BY BUILDING them in reverse, the Marines got a bargain in barracks. The long one-story structures, for the Artillery Training Center at Twentynine Palms in the California desert, were put up hind-end-to: first the walls, then the roof and last the supporting beams.

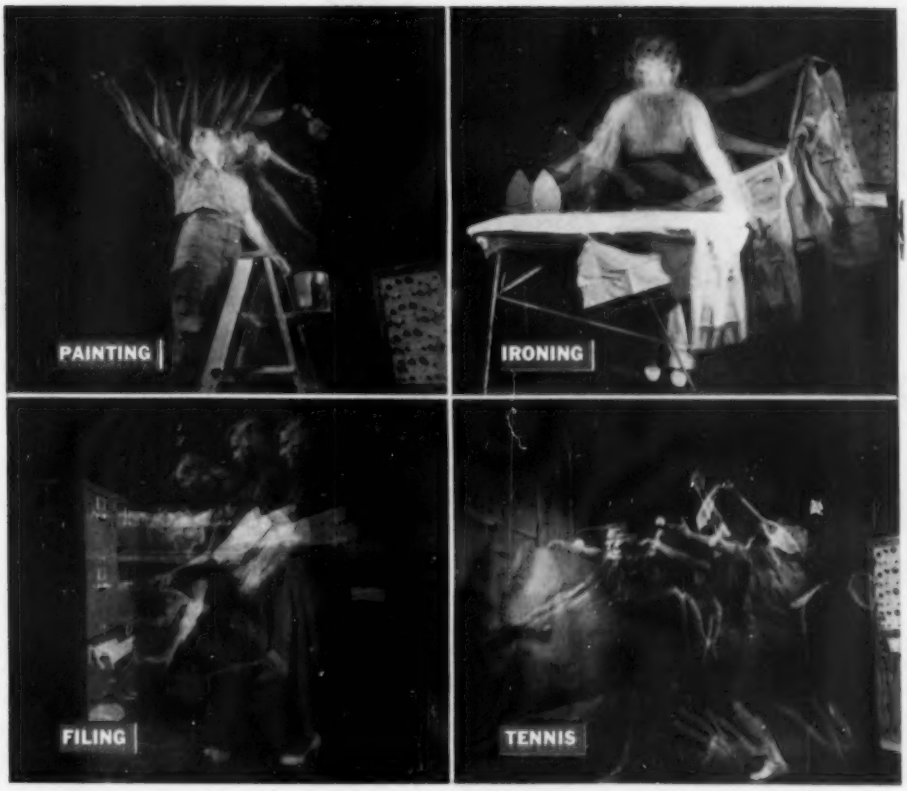
This unusual technique made it easier to cast all the big concrete roof panels at one central production line. Walls were cast on the barracks floors and tilted into place. The supporting beams were cast through the roof seams.

Constructed this way, the barracks cost $8.10 a square foot, including air conditioning. That's 15 percent cheaper than the average new home—without air conditioning.



ONLY THE FORMS in which the roof beams are to be cast support the heavy concrete roof panels, which were craned into place.

GAPS BETWEEN ROOF PANELS permit under-roof beams to be poured from on top of roof. Same operation seals up the gaps.



Who Is Working the Hardest?

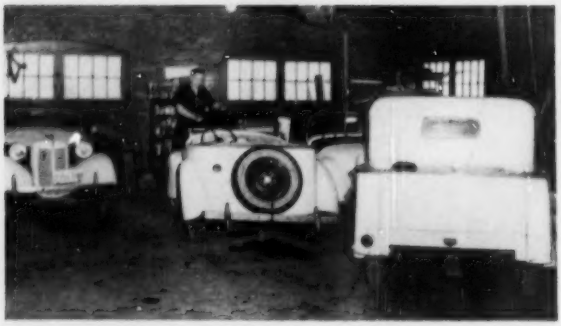
THESE multiple-exposure photos trace the movements of people working at ordinary jobs—and one at play—while an ingenious laboratory platform (right) measures the peak effort for each task. Which of the four do you think was working the hardest?

You may be surprised at some of the answers: The peak energy of the man painting the ceiling was only one-sixth that of a man lifting a 50-pound weight. The woman ironing a shirt put out twice as much peak energy as the painter; and the girl filing papers in four drawers, nearly twice that of the housewife ironing. The tennis player's peak output was nearly six times the painter's.

LAURU PLATFORM in DuPont's Haskell Laboratory measures energy used to lift a 50-pound bag.

RESPLENDENT IN NEW PAINT, Bantams of various types are displayed on Cole lawn.

He Collects Young



GARAGE WILL HOLD a lot of these midgets. Collector here works on an engine surrounded by a '38 roadster, '39 phaeton, '41 convertible coupe and '39 pickup. The Bantam company turned out nine body styles in the brief space of four years.

QUARTER-TON PICKUP Bantam, vintage 1939, hauls hay for Cole ponies. Owner has rebuilt nine Bantams in four years. Vocationally a producer of marionette shows, he had to acquire his knowledge of auto mechanics as he went along.

With a soft spot in his heart for the Bantam (remember it?) George Cole now rebuilds these bygone buggies in his garage.

Antiques

SOME people collect stamps. Some collect coins. George L. Cole collects old Bantam cars.

Remember the Bantam? All its upholstery was genuine leather. It weighed about a third of what today's Fords, Chevvies and Plymouths weigh. It had a 20- to 24-horsepower engine. Its wheelbase was 75 inches—10 inches shorter than that of Nash's little Metropolitan. From 1938 through 1941 it was made by the Bantam Motor Co. of Butler, Pa.

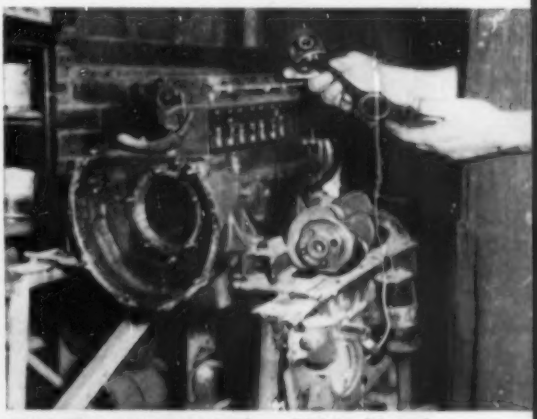
Cole has Bantams parked in the garage, the carriage house, the driveway and the yard at his home in Palos Hills, near Chicago. He has rebuilt a Bantam convertible coupe, four-passenger phaeton, convertible sedan, pickup truck, panel truck and station wagon.

Cole's interest in the 1,200-pound autos dates from 1950, when he bought a 1938 Bantam sports roadster in Westmont, Ill., for his daughter. By the time he had finished rebuilding it, she had a snappy runabout and he had a new hobby.

Since then he has foraged many a scrap yard, back lot, garage and barn for Bantams and the parts. The standard models were built by a firm that was an heir to the American Austin Company.

The Butler branch of Austin had been manufacturing pony-sized cars since 1930 under patents leased from Austin of England. In 1937 the American firm decided it was time to break ties with the old country and tool out a different machine. They gave up the parent firm's name and re-dubbed their cocky little doodlebug "Bantam."—*Kenneth Wylie.*

LAST BANTAM MODEL built was this 1941 convertible coupe. Electrical system is six volts. Four-wheel brakes are cable-operated. Transmission is same as that in 1938 Graham.



FOUR-CYLINDER ENGINE has 50.14-cubic-inch displacement—2.26-inch bore, 3.13-inch stroke. Aluminum is used liberally in it. Three main bearings are pressure-lubricated.

BANTAM'S DIMENSIONS—10½ feet long, five feet wide—are emphasized by Chevvy alongside. Cole cars are painted red and white to make them extra-visible on open highways.

Running his neon-tube screwdriver over the plugs, then shorting them out one by one, proved to Gus that the plugs were firing, and tied the miss solidly to number four.

Gus Encounters a Stubborn Miss

Had Miss Wilks lost her head over him? . . . Or was it just a cylinder head that brought the lady to the Model Garage?

By Martin Bunn

WHEN Emma Wilks, the comely new schoolteacher, drove her badly missing 1948 sedan into the Model Garage, Gus Wilson anticipated nothing more complicated than a routine repair job.

"After all," Emma said, her blond hair tickling Gus's burly neck as they peered beneath the raised hood of the car, "it isn't dignified for a schoolteacher to drive around with a bucking, missing car, is it, Mr. Wilson?"

"No, it isn't," Gus told her, carefully avoiding Emma's big, blue eyes.

Knowing that Emma had but recently bought the used car from a reliable dealer in the city, who had completely overhauled it, Gus at first suspected loose gaskets.

"My, what strong hands you have," Emma remarked as Gus tightened cylinder and head gaskets.

Cylinder Compression Is High

With the motor still missing, Gus ran a compression check and found all cylinders high in readings. Running his neon-tube screwdriver over the plugs, then shorting them out one by one, proved that the plugs were firing, and tied the miss solidly to number four.

Full compression on a compression check, with the motor turning slowly with the starter, and a miss while running, with good ignition, suggested a gummed and slowly closing valve. Since the new valve grind made this extremely doubtful, Gus's thoughts turned to a weak or broken valve spring, or too close a valve setting. Removing the valve

cover to check this, he was astonished to see one of the half-moon valve keepers of number-four intake valve lying on the cylinder head.

The remaining half of the keeper held the valve, but caused the spring to cock to one side, binding the stem.

"Here's your trouble, Miss Wilks," Gus said.

"I just knew you'd find it," Emma gushed. "You're wonderful."

Red-faced, Gus removed the metal cap that rode the top of the valve stem, to prevent excessive oil from running down the stem, held the valve pried up against the inside of the head with a crooked bar thrust through the spark-plug hole while he compressed the spring and replaced the valve-keeper half. The engine now ran smoothly.

"I wish you'd stop annoying my wife and me with your used-car bargains."

"I just knew that I could depend on you, Mr. Wilson," the schoolteacher exclaimed admiringly.

"And you're a bachelor, too, remember, Gus," Stan Hicks chuckled as Emma drove out. Stan hummed the *Wedding March* as he worked.

Ever since Gus had unwittingly bid on the new teacher's lunch basket at the church box social a couple of weeks earlier, folks had been eager to build a romance between Emma and the town's most eligible bachelor. Leaders in this were Gus's pals, the irrepressible Elmer Stoddard and Pete Vancourt.

"You'll be all wrapped up in matrimony before you know it, Gus," they had told him.

"Emma just bought that car so she could drive it in here for you to repair while she whispers sweet nothings."

"Go soak your heads," Gus had told them angrily. "She hasn't brought the car in to me yet."

"Give her time," Pete Vancourt had grinned. "I'll bet her car develops more mysterious complaints in the next few days than a 1908 Model T."

And now, Gus thought, smoking at the bench, she had brought it in. But it wasn't a mysterious complaint. Whoever ground those valves just didn't put the valve keeper in all the way.

But the next day Emma again brought the car in—and Gus found the same valve keeper lying on the cylinder head.

"Now isn't that strange?" Emma said, as she stood at Gus's shoulder.

More than strange, Gus thought to himself as he replaced the keeper, bade Emma farewell and watched her drive out.

"Hah!" Stan Hicks chortled as she pulled away. "What did Elmer and Pete tell you?"

"Now look here," Gus bellowed. "If you mean to intimate that the lady took that valve keeper out herself, just so she would have an excuse to come in here and—"

Gus halted in midspeech, while a wary look came to his eyes.

"But," he demanded of no one in particular, "how in tunket did it get out? Do you suppose that Pete and Elmer sneaked over at night and did it? They could, you know, with Miss Wilks's car parked behind the boarding house."

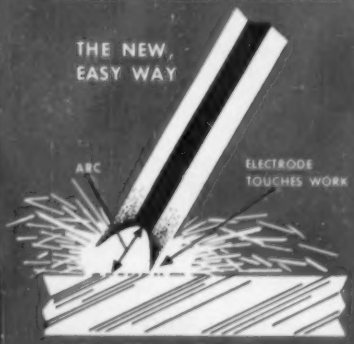
"Now, Gus," Stan advised, "don't fight it. When a lady sets her cap for a man, he's—"

Gus didn't wait to hear the last of this remark. He tossed his cap on the bench and went down the street to the restaurant. By the time he had returned the worst had happened. Pete Vancourt and Elmer Stoddard had gotten together with Stan Hicks.

"Brother," Stoddard greeted Gus, "are you hooked! Like a gaffed bass."

[*Continued on page 244*]

NEW TOOL FOR THE HOME: Just draw this new rod and holder along a joint and you've made a weld with almost the ease of using a lead pencil.



SPECIAL COATING on new rod forms shell around core that automatically sets correct arc distance while you simply draw rod along joint. Old rod had to be held exactly above work to make arc.

MECHANICS *and* HOMEBUILDING

'Even I Can Weld Now'

New home-size welding outfit and kits of steel make anyone a metalworker.

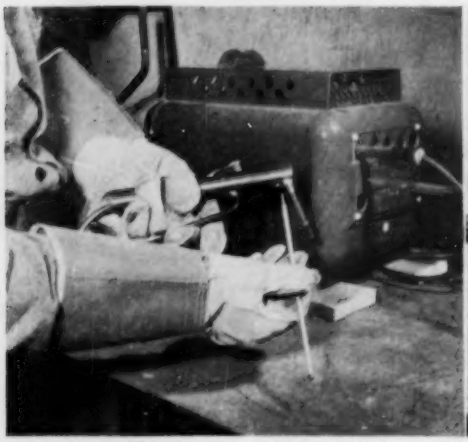
By Sheldon M. Gallager

YOU may not believe it, but that could be you in the picture above. I know, because it's a picture of me the first time I ever held a welding electrode, a month or so ago. I was really welding. Did pretty well, too.

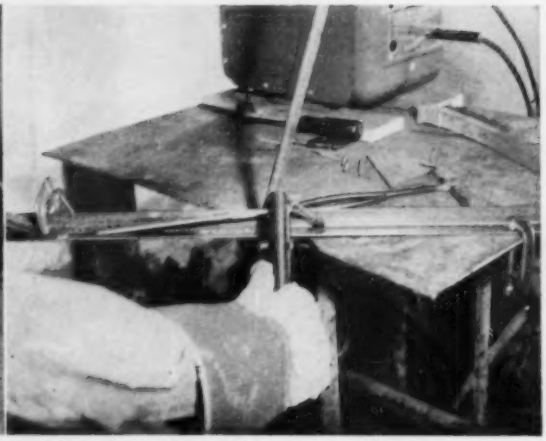
The occasion was a personal test of a brand-new, home-size welding machine and a special electrode and holder designed for the novice. The manufacturer claims this outfit makes just about anyone a welder. As a qualified guinea pig, I can say the claim is justified.

With that new electrode, you just can't miss. You keep it in constant contact with the work. There's

This special holder keeps the rod right on the beam for you



NEW ROD HOLDER has starting switch on handle that lets you position the electrode before turning on the juice. Matchlike tip on rod is special conductive coating that makes it easy to start arc without old striking motion.



THAT LEG IS A REAL HELP to weary welders. By resting it against the work, you can easily guide the rod along without having to hold your hand in mid-air. Welder works on any 220-volt, 20-amp. line or 110-volt, 40-amp. line.

no jabbing blindly in mid-air to strike an arc in the difficult old-fashioned way.

It's not too expensive, either. The Lincoln Electric Co., 22801 St. Clair Ave., Cleveland, has priced it under $100.

Using some of the steel you now can buy in small lots from local hardware stores, I put the new outfit through its paces by building a lawn table for our terrace. If you haven't heard of hardware-store steel, you may want to know about it.

Handi-Steel, produced by the American Industrial Products Co., 1448 E. 49th St., Cleveland, can already be found in many stores and offers everything from small rounds and flats up to heavy square and angle stock in convenient carry-home lengths. U. S. Steel is also testing a similar package that may go on the market soon.

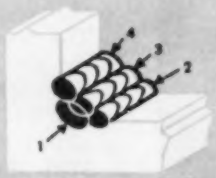
New rod makes it easy. The real key to do-it-yourself welding lies in a special new electrode—appropriately named Selfweld, since it does most of the work itself—developed by Lincoln especially for home-workshop use. It comes in two sizes, 5/64" and 3/32".

The new rod is so different from the old types that I actually had to unlearn what little I knew about conventional welding. My first attempt was a struggle because I was pulling the electrode away from the work, trying to suspend the point in mid-air while running the bead along the joint.

That's what used to make welding so

Here's how you can make sound

ON LONG RUNS, it's best to tack pieces at several points before making complete weld. If you just start at one end, concentrated heat may warp metal, throwing joint out of alignment.



ON HEAVY STOCK, say above ¼" thick, you may need to build up several welds to form a strong joint. Lay first bead in center, remove slag, add successive beads in the order shown at the left.

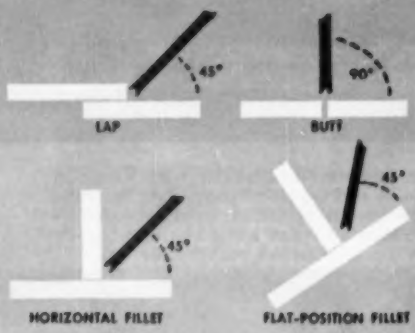
LEG IS ALSO USED to help position rod exactly where you want it to weld. Thus you can rest holder on leg with rod just above work, close your face shield, then lower the electrode and be sure it won't land way off in left field.

IT WELDS BY ITSELF. Here's how no-hands welding can help you in tight spots where you need both hands to hold the parts. Rod, leg, and holder form tripod that stands by itself and keeps electrode on the spot you want welded.

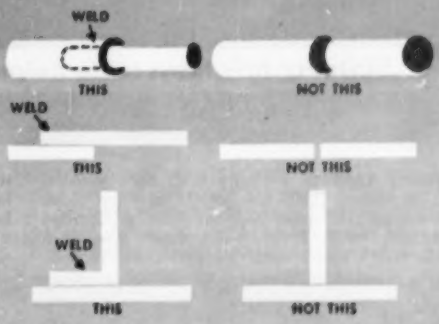
tough. If you don't think it was, try moving a pencil in a straight line with the point ⅛″ above a sheet of paper, without moving any closer or farther away. This spacing was needed to maintain the proper arc distance.

Now imagine that the pencil is burning away a fraction of an inch every second so that you have to keep feeding it inward, and you're doing all this while wearing goggles so dark you can't see much besides the arc. There you have a fair idea of what welding used to be like.

With the new rod, you touch the tip



ALL WELDS fall into one of three classes—lap, butt or fillet—shown above. Fillet welds are easier if you can block up the work so that the rod is pointing nearly straight down, as at lower right. In all cases, slant the rod 30° from vertical in the direction of travel.



KEEP THIN SHEET FROM BURNING THROUGH by using the lap joints above, so that you're always welding on two thicknesses instead of one. On tubes, slip a smaller diameter inside a larger one, or slot the end of one so that it can be forced over the end of the other.

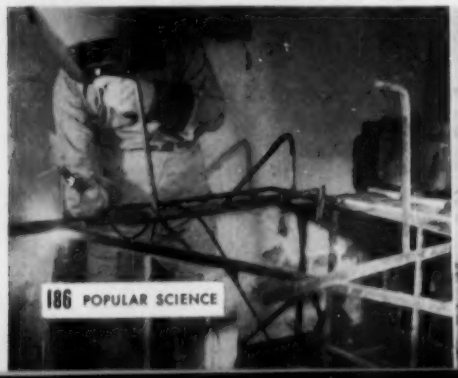
right to the work, simply drawing it along the joint as easily as drawing a pencil along a ruler.

Coating does the trick. The secret of the new rod is a special coating containing powdered iron that forms a shell around the wire core. The core burns slightly back inside the coating, automatically maintaining the correct speed and arc distance even though the shell is touching the work.

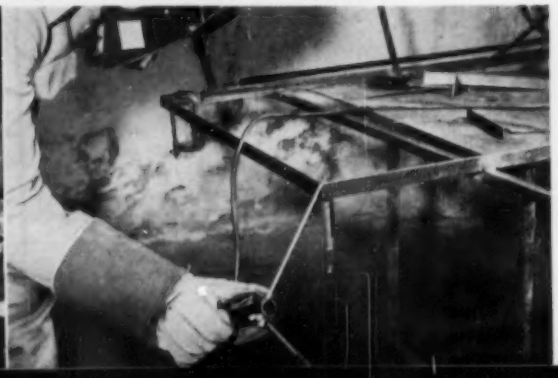
The old rods were hard to start, too. You had to strike them like a match—touch them to the joint, and hastily yank

Building this lawn table helped me learn some welding tricks

I WELDED LEGS to 1" rails first, then welded rails to frame. Rails are set 9" in from sides and extend 10" past end for handle. Clamps hold rails while I tack-weld them. Complete welds aren't made until all joints are tacked.



HERE'S A CORNER I had trouble with. I learned later just to tack outside lightly, then lay main bead down inside of the angle where rod can't slip off. Note how you can rest the electrode right on the joint before starting the arc.



them back from the arc gap. By then you were often several inches away from where you were supposed to be welding. The new rods have an electrically conductive match head on the tip that fires up the instant you switch on the current. Once started, the fused iron at the tip is conductive, so the rod will easily restart at any point along its length.

Holder helps beginners. Along with the special rod, the Lincoln people have developed a new electrode holder that helps people like you and me get started.

There's a switch built right into the

LAWN TABLE is 17" high, a comfortable coffee-table height. I used 14" wheels from a Planet Junior cultivator (available for about $3 apiece). Start with wheels since size will determine axle position and length of legs.

HEAVIEST WELDING JOB was joining ½" axle to ½"-bar wheel strut. Using maximum current, I laid welds alongside both sides of axle in the strut crotch, then flipped job over to weld axle to both sides of strut from below.

WHEN JOINTS ARE TACKED, table is turned right side up, all clamps are removed and welds are completed. This helps keep heat from warping and shrinking metal, which might happen if you finished each joint as you went along.

handle. This lets you place the electrode where you want to weld *before* turning on the current, instead of turning it on first and trusting to luck that you'll hit the right spot.

There's also an adjustable, rubber-tipped leg fastened to the holder that can be run along the work to help guide the rod and keep it at the correct angle.

I hadn't soloed for more than a few hours before I found myself dispensing with both the switch and the leg. But that's just what's so good about it. You can use the gimmicks to help you learn, then operate the holder as a conventional one whenever you want.

Lights out. When you flip on the switch, the first thing you'll find is that someone has turned off every light in the house—that's the darkened safety lens you're looking through. What happens next will look like a Fourth of July Roman candle, seen from the wrong end.

The tendency is to jump a few feet backward and upward—or at least I did. But once you've gotten used to it, you'll be teaching Grandma to weld a hitch on the old buggy without any qualms.

Selecting the heat. Along with the new rod and holder, there's a new home-size welding machine, called the Lincwelder 100. It has six current taps, or "heats," that offer a range of from 50 to 100 amperes.

Using too little current results in poor penetration, as the pros say—not enough metal melted deeply enough to form a good, solid bond.

But my first trouble was too much heat. It was a corner joint, and the more I welded, the more the metal just melted and puddled away. Then I really poured on the juice and did a fine job of welding a C clamp right into the piece. The joint, however, refused to stay stuck.

Checking back on the instructions, I learned that I was melting the metal so fast that it was burning right through before it had a chance to fuse. When I switched to a lower tap, I found I could gradually build back the lost metal, almost like weaving a patch.

That's the beauty of welding. While the fit should be as good as you can make it, you can correct sloppy joints with a judicious build-up of welding metal in the right places. And if the first weld doesn't take, you can run another one right through it, as many times as necessary.

Chipping slag. The new rod leaves a somewhat thicker slag than conventional electrodes, and this must be carefully broken off with a chipping hammer before you can check the weld under it.

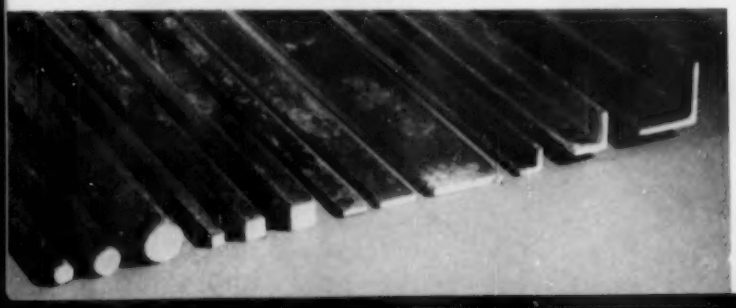
Occasionally, like me, you'll find a weld that looks great, but is actually held together by nothing but slag, which is roughly equivalent to spit in holding power. You must remove this slag before you reweld a joint or build up one bead on top of another, or the new welds won't take properly.

Precautions. In transformer-type jobs like the Lincwelder, the working current is totally separate from the house current, so there's no chance of striking up an unwanted acquaintance with an oil burner, gas line or anything else you might accidentally touch with the rod.

The rod does spit hot, molten sparks,

How you can select the right rod and current for the job

Plate Thickness		Electrode Size and Color Marking	Tap Settings	Amperes
Inches	Gauge			
3/64"	18	5/64" Red	2 or 3	55, 65
1/16"	16	5/64" Red	4 or 5	75, 85
5/64"	14	5/64" Red	4 or 5	75, 85
1/8" or thicker	10	3/32" Blue	6	100



ASSORTED STEEL, now available at hardware stores, makes it easier for everyone to work with metal. Kits include flat, round, square and angle stock from ¼" to 1".

For the lift-out tray, I chose a piece of fancy expanded metal

though, and you should work in as fireproof a place as possible. The best bet is a clean, dry corner of the cellar or in a masonry garage.

It's long, it's low, it has wheels. The thing that started all this was a casual remark by my wife about wanting some sort of lawn table to put out on the terrace. In the stores, what the prices didn't do to scare me off, the designs did.

Most commercial tables are so high you have to sit bolt upright in a straight-back chair to reach them, which isn't my idea of relaxing on a sunny summer day.

What I wanted was a table I could reach while reclining in a lounge chair, moving as little of me as possible.

The result, I think you'll agree, is something you won't find in even the fanciest stores, yet it contains only about $5 worth of wood, $10 worth of steel, and took less than two days to make.

Making the table. It is essentially just a 4'-square frame, made of ¾" steel angle, that supports a wood deck. The deck is made of ordinary two-by-fours cleated underneath and spaced ⅛" apart so that water will drain off quickly.

Two heavier rails of 1" angle are welded to form the undercarriage. The wheel struts and legs are bent up from ½"-square stock and welded to the rails.

Pounding with a heavy hammer, I found I could gradually bend the ½" bar, but I don't recommend it as an easy way to form stock.

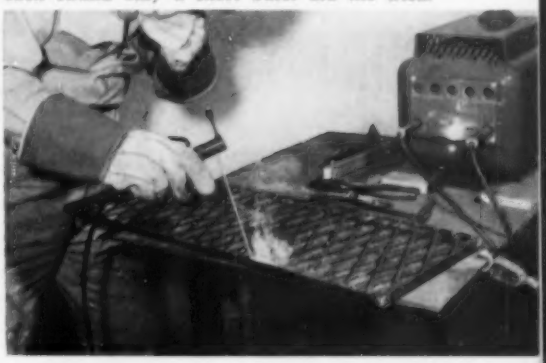
Up to ⅜", solid rounds and bars will bend fairly readily, but beyond this I'd suggest heating the stock first. One way to do this is with a carbon-arc torch, available as an accessory for the Lincwelder, which can also be used for hard-soldering and brazing. Or you can hacksaw the parts to size, then weld them in the desired shape.

When I was all finished, I surveyed the table and thought: "Boy, am I going to have fun relaxing this summer!" Then I took a look at the welder and thought: "Am I going to have fun welding!" END

THAT'S A BAD GAP in that corner joint, but I learned how to fix it by welding in a short piece of electrode to fill the crack. Tray frame is made from ½" angle. Handles are bent up from 3/16" round stock.

AS CUTTING TORCH, welder makes short work of slicing section of expanded metal for the tray bottom. We clamped on a length of angle for a guide, then drew the leg along the angle so that the rod made a neat, straight cut.

TICKLISH JOB is tacking expanded metal to the tray frame without burning the thin strands. I used small rod, lowest heat, and aimed the electrode mostly at the frame metal. Giving each strand only a short burst did the trick.



Try your carving tools on a

Working Model of Atomic

Twin screws make this facsimile of the* Nautilus *skim through the water.

By Roy L. Clough Jr.

WHETHER you exhibit her on a trim display stand, or send her planing through the water with decks awash, this 18-inch model of the world's first atomic-powered ship is bound to be an eye-catcher.

Her dynamically simple hull is relieved by just enough fittings to give her the grimly efficient look of her big sister. Better yet, an ingenious twin-screw drive puts the atom-size sub through her paces with an authentic fan-tailed wash. Her rubber-band engine is as silent as a nuclear reactor, and while her cruising range is limited, she travels at faster-than-scale speed.

To build your *Nautilus* model, either scale up the plans on the following pages or send for a full-size blueprint (see free offer). After tracing the side, top and cross-section outlines on thin paper, glue the tracing on cardboard and cut out a set of patterns and templates.

Hull construction. For your powered model, you'll need a split hull, so you can carve out a cavity for the propulsion unit. Use two blocks of soft, dry pine, both a bit over 18″ long and 1⅝″ wide. The lower block should be 13/16″ thick, and the upper one 15/16″.

Stick the two blocks together with mucilage, so they can be parted easily

PROFILE OF THE SUB is marked out on hull block (two pieces of pine glued together).

HULL BLOCK IS SHAPED with a jackknife, using templates frequently to check contour.

Submarine

after the hull is shaped. Use the top and side patterns to outline the hull on the wood, and jigsaw the sub to rough shape. Then, checking with the templates as you go along, whittle the hull to final contour with a jackknife and smooth with sandpaper. Carve the conning tower from a separate scrap of wood, and dowel and cement it in place.

AFTER SANDING, hull halves are parted so interior can be scooped out with a gouge.

Finally, split the two hull sections apart and scoop out a cavity that will leave a shell approximately ⅜″ thick. Drill holes through the deck section to vent air when the model dives.

Propulsion unit. A glance at the detail drawing shows the simple gear arrangement which makes one rubber band drive the two propellers, turning them in opposite directions. You can salvage gears of the type shown from old alarm clocks and pick up the wire shafts and brass bearing tubes at any model store. Because most clock gears have large center holes, you may have to bush them by rolling a scrap of shim brass around each shaft before soldering the gears in place.

Now solder the bearing tubes to the tin tail assembly, taking care that they bring the gears to a good mesh.

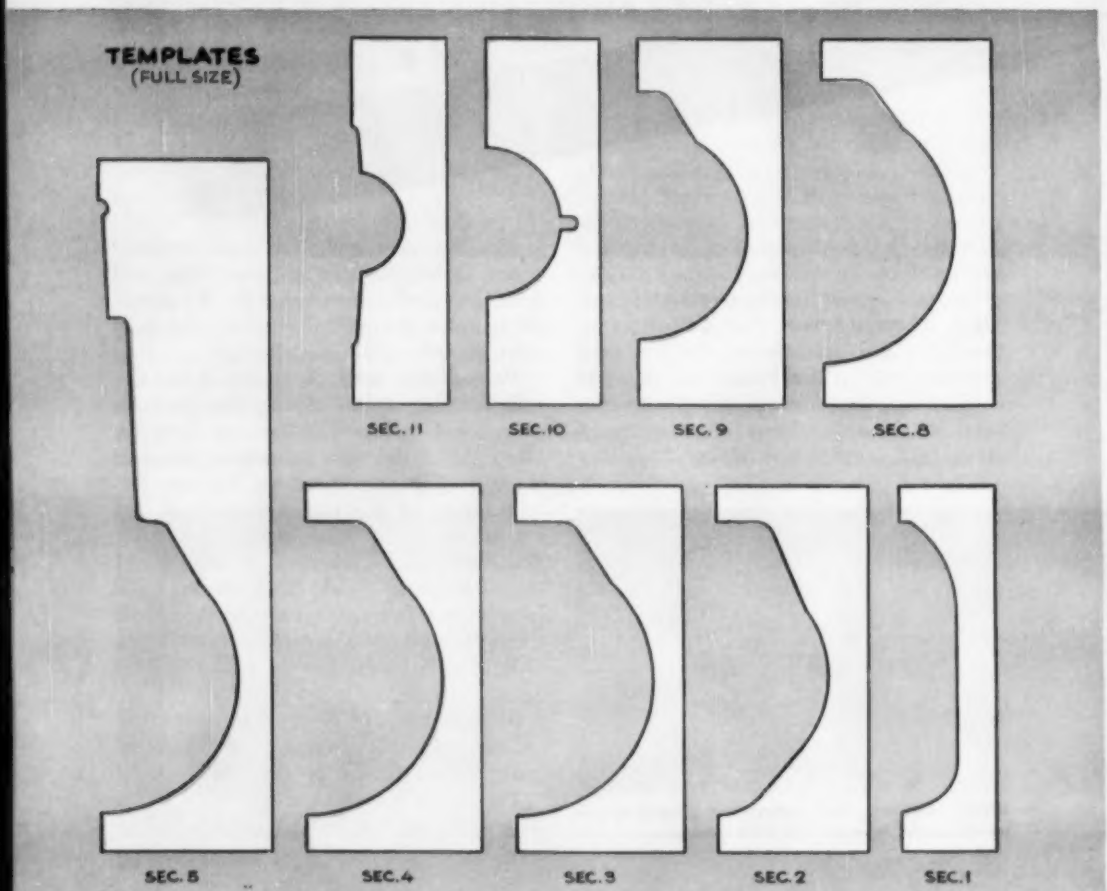
The propellers, which are about twice scale size, are cut from tin stock. Twist

WITH TAIL ASSEMBLY ATTACHED to hull, gears are rechecked for nonbinding action.

PLASTIC MODEL PAINT is used for detail painting. Base coat is sprayed-on lacquer.

the blades of the two props in opposite directions to compensate for their counter rotation. Slip a cardboard washer over the shaft projections before soldering the shafts in place. Otherwise you may stick the shafts and bearing tubes together. Tear off the cardboard after the solder sets and you're ready to cement and brad the tail assembly to the top section of the hull.

At the bow end of the same hull section, drill a hole to receive a winding hook made of thin spring wire. Form the hook first, then slip the wire through the hole from the inside and bend a crank at its outer end. Friction will keep this



winding hook from turning as the engine (a loop of ⅛" flat model-plane rubber) spins the props.

Ballasting. To make the model operate at proper depth you must ballast it with lead or babbitt. Push a few pins into the lower hull section, fore and aft, and pour in enough molten metal to give the half-hull a total weight of 13 oz., with the balance point coming about halfway between cross sections 5 and 6. With this much ballast, your model should run with her decks just awash.

If you want to make her dive and run completely under water, add another ounce to the bow ballast. No dive rudders will be needed as the forward slope of the deck, under this additional weight, will produce a planing effect that carries her downward until the power runs out, when she'll return to the surface.

Final steps before commissioning. As shown in the drawings, a flathead wood screw holds the two hull sections together. (They need not be watertight.) Mount the periscopes, radar and communications antenna on the tower and scribe forward diving planes on the hull.

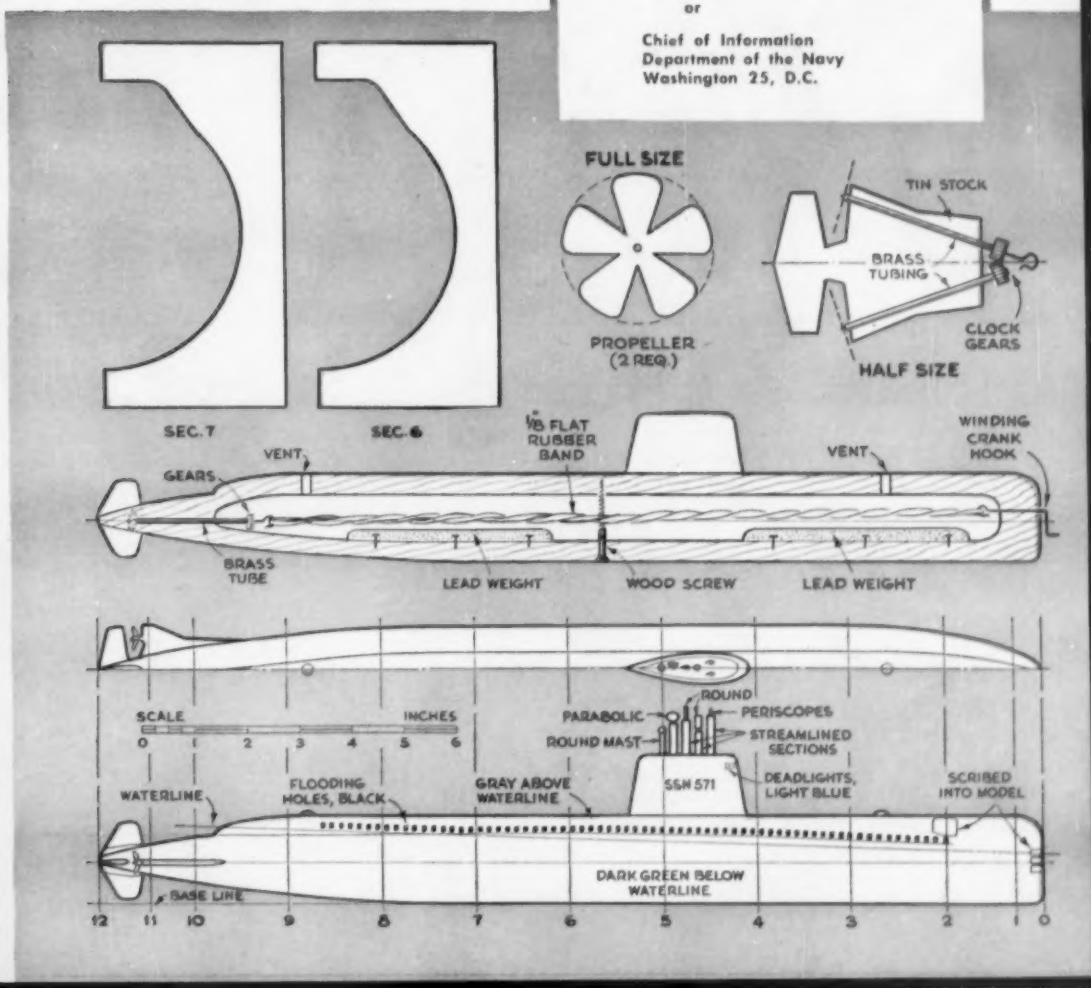
Separate the hull sections again for painting. Follow the color scheme indicated on the plan and, for a flossy finish, use lacquer, rubbed down with steel wool.

Work-size blueprints for building a scale model of the atomic submarine *Nautilus* may be obtained, without charge, by writing to:

Public Relations Department
Electric Boat Division
General Dynamics Corp.
Groton, Conn.

or

Chief of Information
Department of the Navy
Washington 25, D.C.



KEEPING THE Home SHIPSHAPE

A CHEAP PUTTY KNIFE makes a plaster-patching trowel. Heat butt dull red and cool. Grind as shown and bend up blade. Reheat to cherry red and cool in oil.

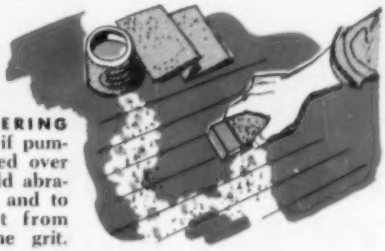
A CEILING-HIGH VALANCE hung over a wall-to-wall tub will hide the shower-curtain rod. Cover the wood with waterproof plastic.

WHEN LAYING LINOLEUM, tape newspaper to the coiled end and cut it to fit at far wall. Bend back the paper and mark linoleum for cutting.

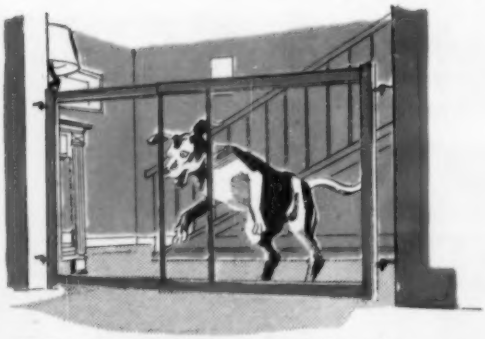
A HOOKED-RUG ADDICT clamoring for a frame may settle for an old card table with the top removed if you brace the framework by adding four corner irons.

HERE'S A CLOSET-DOOR VALET to hold clothes and pocket contents neatly overnight. It's just a lipped shelf, with a hanger (hook removed) fastened underneath on a spring-loaded hinge so it swings up when unused.

FOR SMOOTHER-GLIDING sliding doors apply a thin coat of shellac to the tracks and the wood strips that ride them. When dry, rub with paste wax.

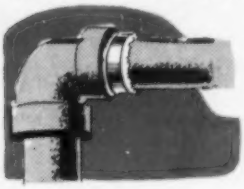


SANDPAPERING goes faster if pumice is dusted over wood to add abrasive action and to keep paint from clogging the grit.



NEED A PUPPY BARRIER? A sliding window screen will keep your living room out of bounds to a pet. Attach it with hooks and eyes so it can't be nosed aside.

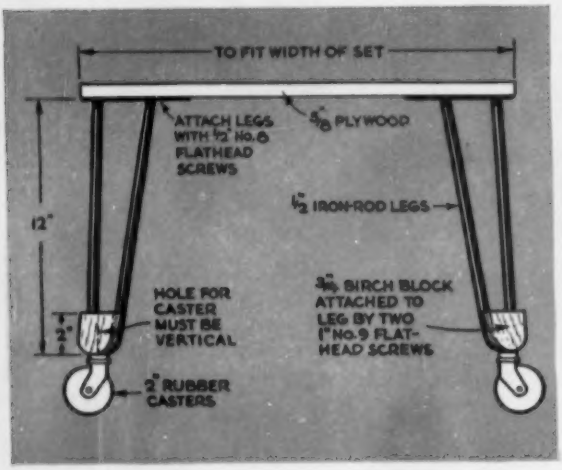
WINDOW-SILL GARDENING won't ruin the paint if the plant pots are parked on a protective coaster. Cut a rubber stair tread to fit the sill and paint it to match the wood.

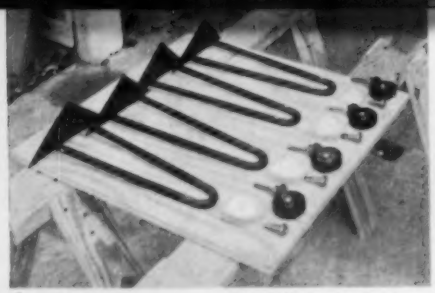


A LEAKY PIPE FITTING you can't unscrew can be sealed with iron cement built up ¼". Bind with a pipe strap, calking under it so cement expands tight as it dries.

How to Put a TV Set on Wheels

Easy-rolling casters and iron legs let you swivel your table-model TV around in any direction without a turntable.





1 PARTS REQUIRED are four hairpin legs with support plates, 2" rubber casters, hardwood blocks for holding casters to the legs. If you prefer not to fasten the legs directly to the TV cabinet, you'll need a sheet of plywood, too.

2 SHAPE CASTER BLOCKS to the curve of the legs and attach them with screws, after drilling holes in the legs. Since legs set at a slight angle, be careful to bore holes for the caster shafts so they are vertical to the floor.

3 ATTACH LEGS to plywood platform with ½" No. 9 flathead screws. The table and caster blocks can be painted flat black to match the iron legs. Legs suitable for the job are now widely available at low prices.—*John Rogers.*

Under fluorescent sunlight, seedlings and plant cuttings develop good healthy root systems.

Cold winds may blow and the snows drift high—but you still can enjoy

Gardening in the Wintertime

By W. O. Hawley and R. F. Dowdle

BY USING fluorescent light, you can garden the year round. You improve on nature by providing spring growing weather even in the dead of winter. With the flip of a switch you produce more hours of daylight than are found on a cloudless summer day.

You can bring delicate, exotic house plants to full maturity on a basement bench. Shrubs and vegetables get a head start while the outdoors is still in the grip of a freeze. They form strong roots, ready to take hold as soon as the soil can be turned.

Unlike incandescent lamps, a bank of fluorescents can be brought close enough to cuttings and seedlings to provide required candle power without danger of scorching. Horticulturists at the U.S. Plant Introduction Garden at Glenn Dale, Md., have had success with daylight tubes in starting seeds and with white tubes for both seedlings and cuttings. Botanists at Rutgers University prefer the white tubes in all cases.

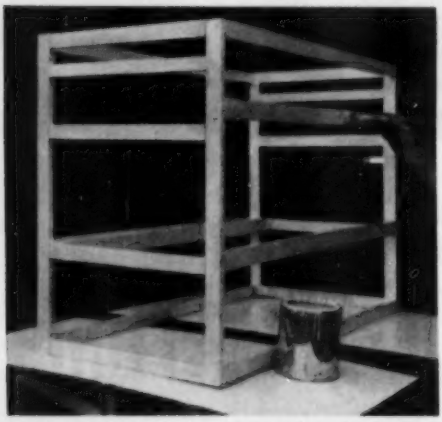
If your basement is warm and humid, hang one or more banks of two fluorescent fixtures 10″ to 16″ above flats placed

Mr. Hawley and Mr. Dowdle are assistant horticulturists in the Division of Plant Exploration and Introduction, Agricultural Research Service, U.S. Department of Agriculture.

on a bench, and turn them on for 15 or 16 hours a day. If your basement is like most—either too cool or too dry—you will need a starting box in which temperature and humidity can be controlled.

The closed case illustrated was built of secondhand materials and odds and ends at a cost of about $25. All new materials should bring the cost up to not much more than $50.

Design and construction. Over-all dimensions may vary according to the size of the fluorescent fixtures used. Two parallel 30-watt tubes and fixtures fit well in a case 3′ high by 4′ long, while the lips of galvanized-metal flats can be held easily on the front and back rails of a box 2′ deep. The 40-watt fixtures measure 52″ and require a unit up to 5′ or 6′ long. If wooden flats are preferred, fit them with lips on the upper edge of the ends and make their length and the depth of your box correspond.



ENAMELED WHITE, the frame of a simple case for starting plants is ready for covering with tempered hardboard. Use one-by-two redwood, or cypress stock, treated with wood preservative.

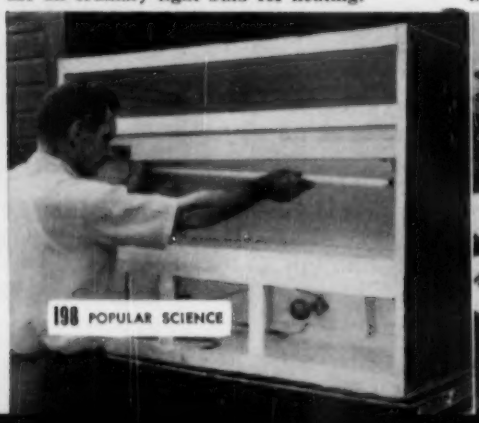
Make the framework of redwood or cypress stock treated first with a wood preservative and then assembled with butt joints. Install one pair of the upper end crosspieces with the top edge 12″ above the planting-stage rails and the other 18″, so that the fluorescent tubes can be placed 10″ above the flats for seedlings and 16″ for cuttings. In the lower position they provide about 500 foot candles of illumination, and in the other between 100 and 200.

For the top, walls and bottom, use a material such as ¼″ tempered hardboard. Attach to the frame with brass screws at close enough intervals to prevent leaking of heat and moisture.

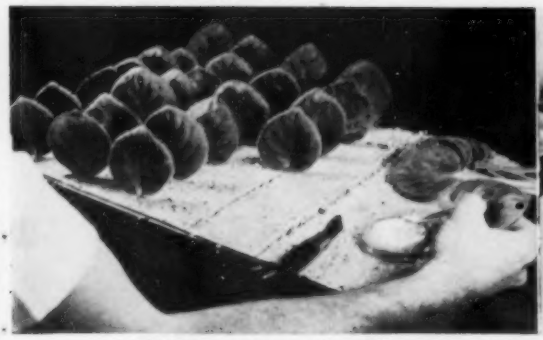
The planting stage should hold the flats close together in order to trap the heat in the chamber below and enable concentration at the bottom of the rooting medium. If you remove any of the flats while the starting case is in use, cover the space that is left vacant.

Bottom heat, controlled by thermostat, may be supplied by one or more electric bulbs or a 75- or 150-watt sealed heater. Such a heating unit, designed to fit a standard socket, may be obtained at an electrical supply house for a few dollars. If properly installed, an inexpensive heating cable would give a still more even heat distribution. Pans of water on the floor of the heat chamber help to in-

TWO FLUORESCENT FIXTURES on movable wood bases serve as artificial sun. Gloss-white interior surfaces intensify illumination. You can use an ordinary light bulb for heating.



SEALED HEATER warms the rooting medium here. Disperse its heat and protect it from drippings with a shield. Central thermometer and thermostat wands permit accurate control.



CUTTINGS ARE ROOTED by sticking the ends in a rooting medium of sand, vermiculite, peat moss, or mixture of these, drenched and drained. Subsequent watering is seldom necessary.

SPHAGNUM MOSS is a good medium for seeds because of its fungicidal protection against damping-off. Shred it through ¼" mesh, pack in firmly, water well and drain before planting.

crease the humidity through evaporation.

Rooting cuttings. After preparing the flats with a rooting medium of coarse builder's sand, greenhouse vermiculite, peat moss, or mixtures of these materials, well watered and drained, dust the cuttings with root-inducing compound and stick in shallow trenches. Place the flats in the case and set the thermostat for a temperature of 72° F.

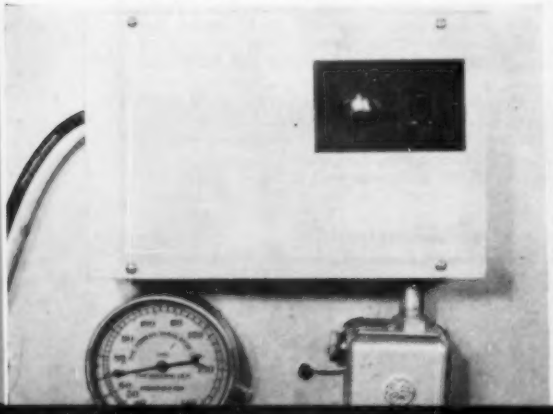
Seed germination. Among the many garden plants you can start from seed are tomato, pepper, cabbage, lettuce, eggplant, cucumber, zinnia, marigold, aster, sage begonia, pansy and petunia.

Sphagnum moss is considered best for seeds, but excellent results may also be obtained with vermiculite. After placing the seeded flats in the case, you may want to cover them with sheets of glass to hold in the moisture. Most seedlings do well at temperatures of 60° to 68° F.

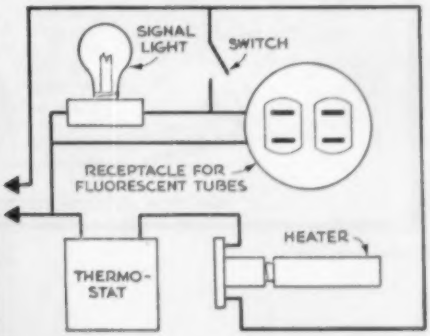
Transplanting. Several days before transplanting, you should open the door slightly and leave it in that position to provide ventilation and thus lower the humidity. Lower the temperature also by adjusting the thermostat, and take every precaution to acclimate the plants slowly to normal growing conditions.

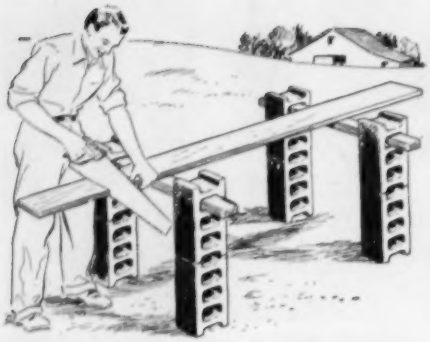
Although it is possible to maintain some plants in the starting case for long periods, it is not designed to meet the requirements of most maturing plants. You can avoid disappointments by limiting its operation to the starting of young plants, and transplanting them as soon as they are well rooted. If it is too early to move them outdoors, keep them for a while in pots on an open bench with your fluorescent fixtures strung up above them. END

YOU CAN BUILD YOUR OWN junction box to consolidate electrical connections from one lead. Mount a switch and indicator light on it to control the fluorescent circuit.



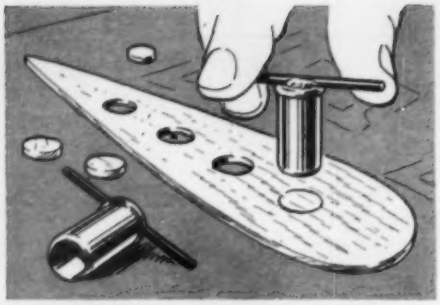
HERE IS THE WIRING DIAGRAM. The heating unit, regulated by thermostat, is constantly on, while you give the plants light at desired periods. A time switch would be a convenience.





Blocks Serve as a Sawhorse

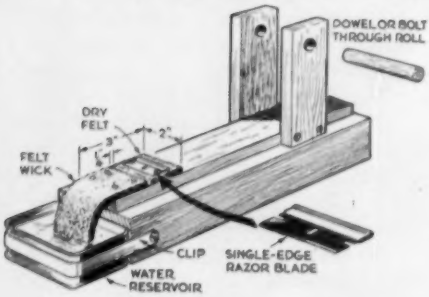
EMERGENCY sawhorses can be made from concrete blocks. Place two-by-fours through the holes as you see above. For a low sawhorse, you need only four blocks instead of eight.—*Ted Otsu, Vancouver, Can.*



Used Shells Will Cut Holes

USED cartridges of the straight-sided variety, in various calibers, make excellent hole cutters for thin sheet-balsa bulkheads and wing ribs. Solder a piece of wire on the cap end for leverage. Twist the other end of the cartridge in sandpaper to produce a cutting edge.

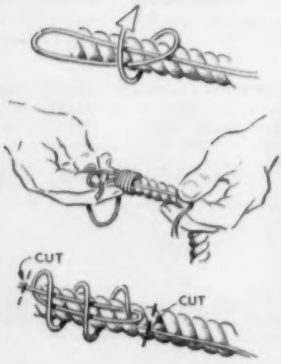
Homemade Tape Dispenser Includes an Automatic Moistener



IF A holder for a roll of gummed tape is needed in a hurry, you can make one from a few scraps of wood. Use a fairly heavy piece, such as a bit of two-by-four, for the base. A piece of felt forms a spring cushion under the single-edge razor blade and protects the fingers.

For automatic moistening, fasten a container to the base and tack down a lampwick in front of the blade, separating it at least ¼" from the dry felt.—*George Walton, Sharonville, Ohio.*

WHIPPING ROPE



Keep rope ends from raveling by whipping them with cord.

1. To whip a rope, loop a section of cord and hold it firmly against the side of the rope, with the loop extending beyond the rope end. Then wrap the long end of the cord around and around the rope and the loop, spiraling it in the same direction as the rope strands.

2. When the tightly drawn cord spiral has nearly reached the end of the rope (from ½" to 1" away, depending on the diameter of the rope), pass the end of the cord through the projecting section of the loop and pull it tight.

3. Pull on the short, or inner, end of the cord until the original loop has been drawn completely through the spiral to the starting end. In doing so, it doubles a second loop of cord under the spiral. Cut off both ends of the cord close to the spiral and you will have a firmly anchored whip.

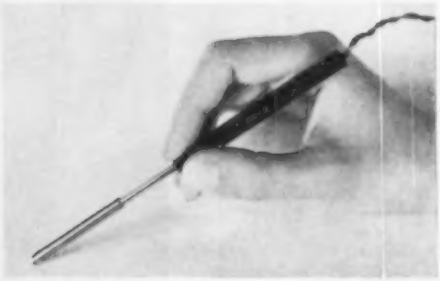
FOR YOUR *POPULAR SCIENCE MONTHLY* INFORMATION FILE

New Tools

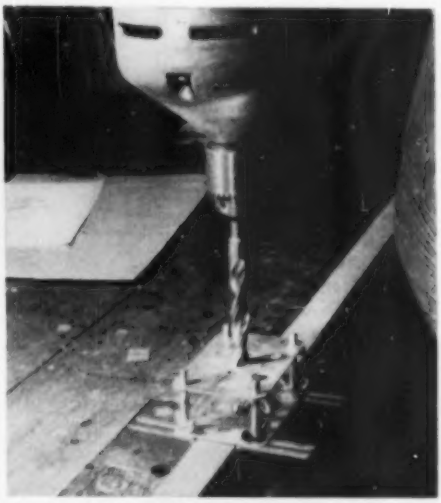
1. Drill Press Speeds Tapping. Chuck this tapping tool in a drill press or lathe and you won't have to struggle to hold it and turn it at the same time. The tap is guided straight and true, while you simply rotate the tool to cut the tap in. Interchangeable holders take different size taps, and holes in the edge of the knurled wheel permit inserting rods when extra leverage is needed for tapping larger sizes.

2. Pliers Hold Cut Wire. A rubbery plastic cushion on the cutting edges of these pliers grips the short end of wire as the jaws close, holding it as the cut is made. This feature keeps flying snips of wire from falling into a radio or TV chassis or possibly injuring an eye.

3. Gauge Measures Pipe. Matching a piece of pipe can be a headache. You get the inch-measurement of your pipe, then buy that size to find that it doesn't fit. With a new metal gadget, measurements are keyed to notches. The edge shown in use (below) is for common pipe from ¼"; the other is for use with tubing.



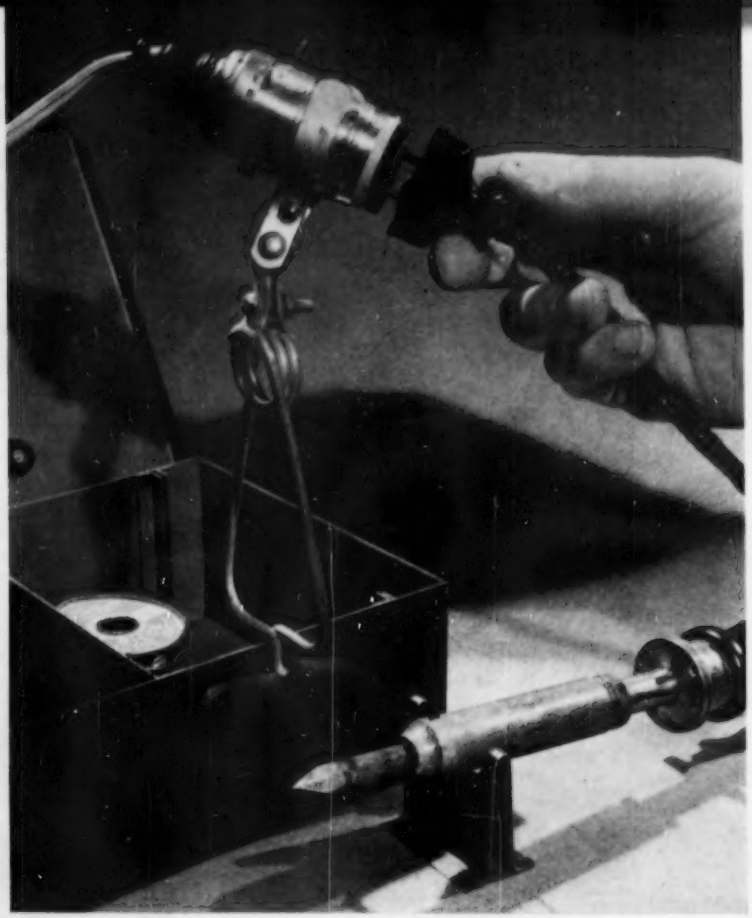
4. Tiny Tool Solders Small Work. Designed for those who work on delicate equipment, the 6" miniature soldering iron above weighs half an ounce. The lead-pencil-size instrument, imported from England, heats up in about 30 seconds.



5. Jig Guides Hand Drill. The accuracy of a drill press is claimed for this device which can be clamped to any flat or curved wooden surface to make straight and accurate holes for doweling or screwing. The jig, which is made of case-hardened, cadmium-plated steel, has side gauges and depth control to make sure that holes drilled are uniform. It has openings for holes from 1/16" to ⅜".

Further information on the tools shown on this page can be obtained from: 1. E & G Engineering Co., 6004 Grace St., Chicago 34; 2. Utica Forge & Tool Corp., Utica 4, N.Y.; 3. Langdon Products, Box 607, Hopkinton, Mass.; 4. Television Accessories Co., Box 6001, Arlington 6, Va.; 5. Mikin Products, Inc., 568 Union Ave., Brooklyn 11, N.Y.

7 Electrical Tips For the Handy Man

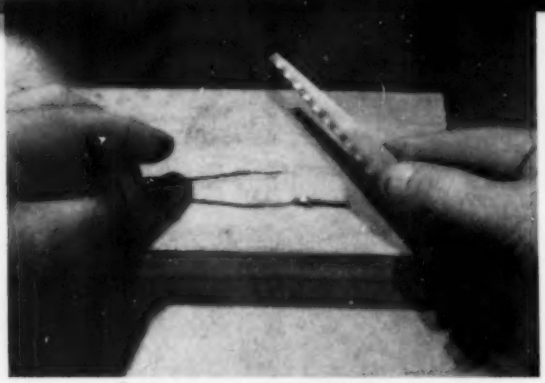


1 AN EXTENSION-WIRE CLAMP can be made easily by fitting the wire with a spring-type clamp. It provides an electric outlet fixed in place right at the job. You will find it especially handy when used with a soldering iron. Just clamp it to the toolbox or edge of the workbench and you will have it within convenient reach when you want it.

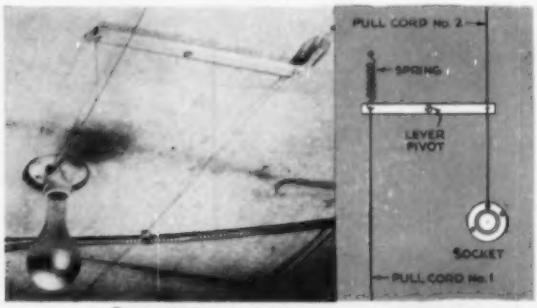
4 TO AVOID SHOCK or a short from exposed binding posts of electrical parts such as the capacitor shown here, cover the posts with rubber nipples like those used on automobile distributor caps. You buy the nipples at garages.

5 PIG-TAIL LEADS add much to the appearance and utility of electrical connections. You can coil one neatly by winding wire on an oil-can spout. The diminishing spout diameter enables you to wind coils of various sizes.

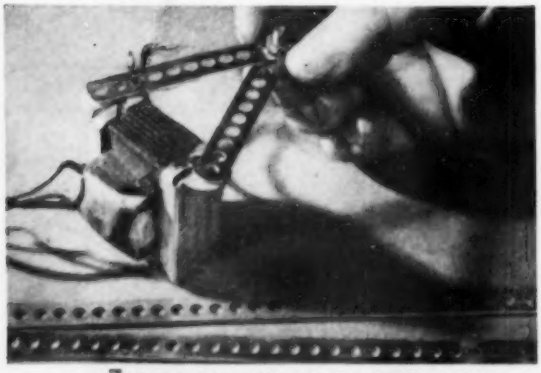
6 WIRE-SOLDERING LUGS will be where you want them when you want them if you store them inside the hollow core of the spool on which the solder is wound. Use corks as stoppers, or turn pieces of dowel to fit into each end.



2 **LACKING A WIRE STRIPPER,** or when a manufactured stripper will not grip the smaller sizes of wire, you can do a quick, neat job with a hacksaw blade. Lay the end of the wire on a bench or piece of wood and press the teeth of the saw blade into the insulation. A quick, sharp tug on the wire will strip off the required amount of insulation.

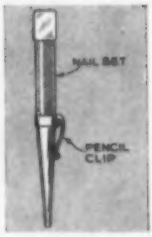


3 **A LAMP IN A PULL-CHAIN SOCKET** can be controlled from opposite sides of the room by a lever-and-cord arrangement like this. A coil spring keeps the first cord taut.



7 **A JIG FOR DRILLING MOUNTING HOLES** can be made from two perforated metal strips from an Erector set. Join them at one end with a bolt, lock washer and nut. You adjust the jig to match the mounting holes in an electrical part, as seen here, and then transfer it to the mount or chassis where the hole centers are prick-punched for drilling.

Nail Set Clips Just Like Pencil



A NAIL SET will always be handy when needed if you slip a pencil clip over it. You can then carry it easily in your pocket.—*W. B. Eagan, Floyds Knobs, Ind.*

Acid Sharpens Tool Burrs

DULLED cutting burrs of electric hand grinders can be revived somewhat by dipping in acid. First clean the tool in acetone and let dry. Then, for a few seconds, dip it into dilute hydrochloric acid or tinner's fluid. Wash the acid off in a solution of baking soda and water. Again dry thoroughly, and oil lightly.—*R. L. Clough Jr., Bristol, N. H.*

Staple Supports Glue Brush

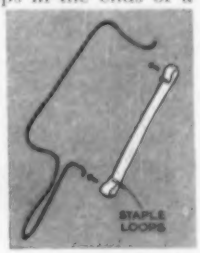
YOUR glue brush won't pick up dirt or mess up your workbench if you solder a staple to the top of the can and rest the brush there.—*H. C. Kenly, Short Hills, N. J.*

Star Drill Removes Pipe

ONE way to unscrew pipe you can't get at with a wrench is to insert a star drill a little larger than the pipe diameter. The flutes should hold tightly on the inside. Use a wrench to hold the drill shank and back the pipe out.—*D. S. Halacy Jr., San Diego, Calif.*

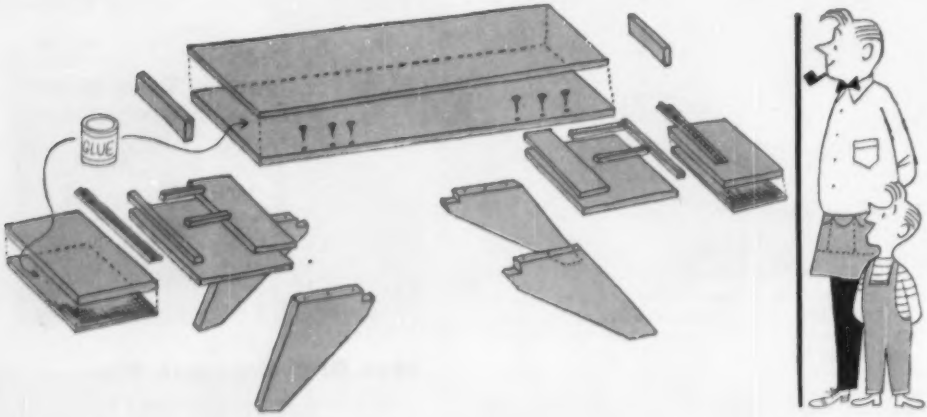
Wire Makes Saw-Type Sander

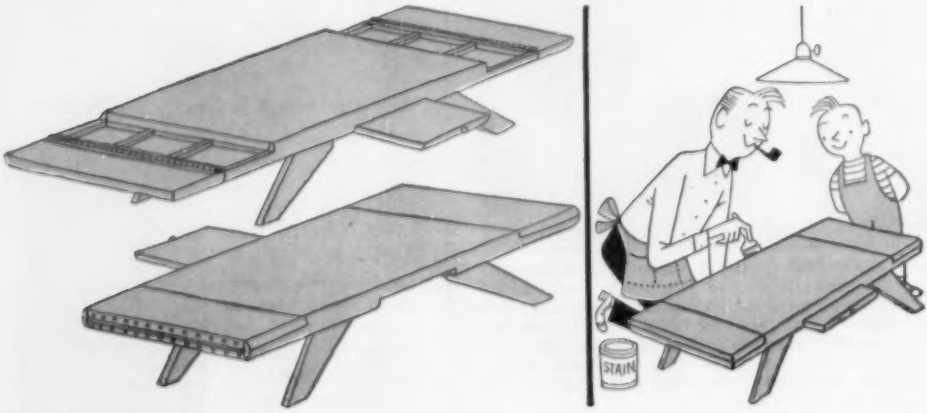
BEND a scrap of heavy wire to coping-saw shape, staple loops in the ends of a strip of sandpaper and you have a handy little belt sander for smoothing rounded shapes. Small ones can be made from coat-hanger wire. Heavier wire gives more rigidity in spans over 5".

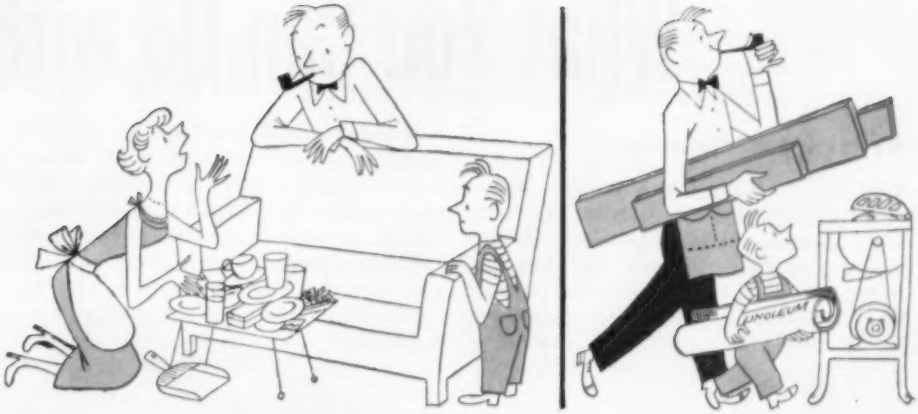


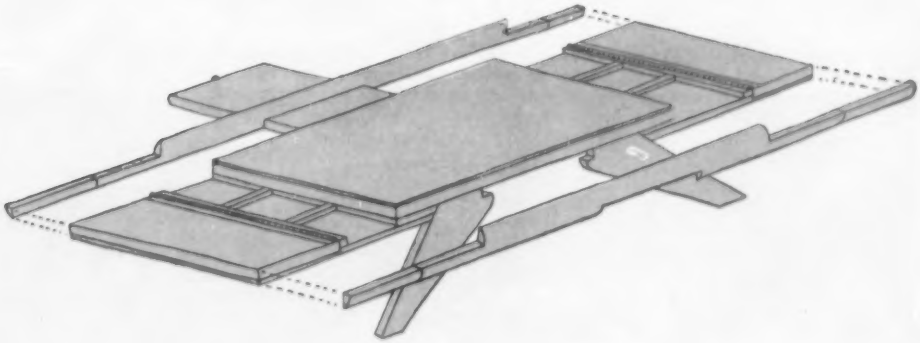
By Roy Doty and Warrant Pryor

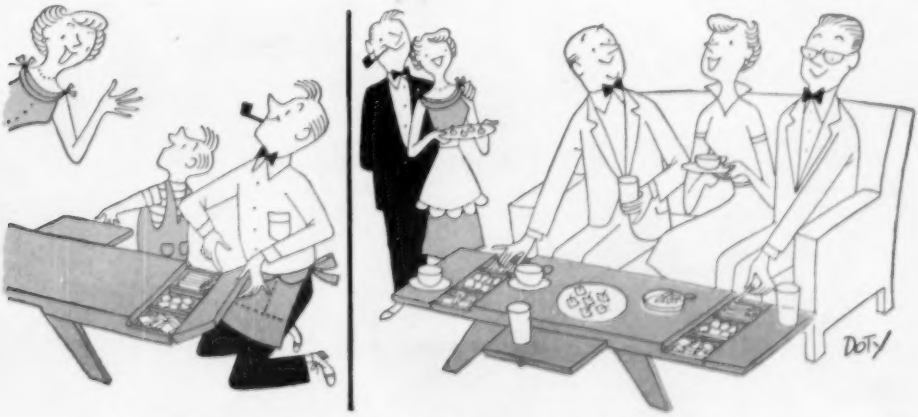
Wordless Workshop











Next Month: A wall desk that files your bills, too

What You Can Do with

By Henry B. Comstock

WANT to put a tough and handsome metal finish on a wooden model or toy? Need some small castings, strong enough to be machined and tapped, dense enough to take a mirrorlike polish? Looking for a filler that can be smoothed to a feather edge? Stymied by a patching problem—possibly a cracked aluminum casting?

Then it's time you latched onto metallic cold solder, the versatile paste now being used, industrially, for everything from mending auto bodies to making sturdy dies, molds and patterns.

What metallic cold solder is. Sold under a dozen or more trade names, metallic cold solder is basically iron, steel or aluminum powder, mixed with a plastic bonding agent. When you apply the puttylike compound to practically any material and expose it to air, the solvent in the plastic evaporates, leaving a hard, grim-gripping material that you can file, sand, buff and even machine.

Some manufacturers also offer metallic cold solder in liquid form; others sell special thinners to dilute the paste. Either way, you can handle the thinned-down product with a brush or spray

HARDENING WOOD PARTS. Aluminum cold solder, diluted and sprayed on this back-yard-railway locomotive front, has coated its wood parts with a weather-resisting metallic shell.

Cold Solder

Hard-drying metallic pastes are made to order for new projects and many old repair problems.

gun, to put a durable metallic surface on metal, plastics—or what-have-you.

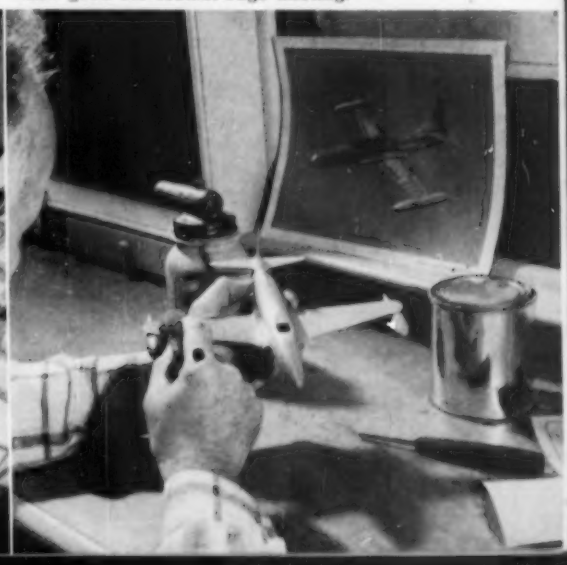
Models. For model and craftwork, your best bet is a cold solder with an aluminum base. Although the hardened material is strong enough to be milled, turned or tapped, it works more easily than iron or steel compounds. In paste form it can be molded as readily as clay. For very thin parts you should shape the

MODELING. You can shape small metallic parts from cold solder. Press the paste over a wire or tin-stock frame, let it harden, and finish with files, sandpaper and steel wool.

TURNING. This miniature ship's bell was turned from maple, given several coats of Hydralloy (a liquid-aluminum cold solder) and then turned again to produce a high gloss.

SPRAYING. A model car-truck side gets a prime coat of lacquer-thinner-diluted cold solder. Paint, whether enamel or lacquer, sticks without trouble to the metallic undercoat.

METALIZING. Want to give that solid wood airplane model an authentic burnished-aluminum finish? Again, cold solder does the trick. It's also good for feather-edge filleting.



CASTING. Model roller-bearing casting, made of cold solder, is peeled from a latex mold. It is only one percent smaller than the metalized wood pattern to its right.

MACHINING. Allowed to harden in an open can, this block of metallic solder was drilled, tapped and halved, revealing exceptionally sharp threads and no friction burns.

MENDING CASTINGS. Widen cracks with V cuts and apply metallic cold solder with a putty knife or spatula. File down surplus material when the paste sets.

material over a wire armature—not for final strength, but to support the paste until it sets. Once hard, the model can be refined with pattern files.

Painting. In liquid form, aluminum cold solder is a natural for metalizing solid-wood models, toughening wood or plaster patterns, or for putting a hard, weather-resistant surface on toys that are to be used outdoors. You can even simulate rough sand castings by applying a heavy mix with a spray gun.

Don't expect wonders when you first brush or spray the liquid on your handiwork. It will dry to a dull gray finish, with no hint of the handsome luster that buffing and polishing bring out. Allow 20 minutes between spray coats, and from three to four hours for a brush job. To clean your spray gun or brushes afterward, use lacquer thinner or the special solvent supplied by the manufacturer.

Casting. Although aluminum solder is too expensive (about $2 a pound) to be used for large castings, you can make sharply detailed miniature parts from it by letting a liquid mix cure in an open-backed latex mold.

For the best results, make the mold half again as deep as the thickness you want in your casting. Pour in enough creamy—not watery—compound to completely fill the mold, work out any air bubbles with a piece of wire, and set aside to harden in a well-ventilated spot. In drying, the solvent will evaporate, giving you a casting that will vary in thickness, depending on the ratio of solids to solvent.

If the part is too thin, leave it in the mold and back it up with more compound. This won't weaken the final product and no part of the second pouring will creep around to the face because shrinkage, other than through evaporation at the back of the mold, is almost negligible.

Patching. You can use any one of the metallic cold solders to mend cracks and broken sections in metal castings. Whatever type you use, clean the area around the break before applying it. Widen thin cracks by grinding a deep V groove along them; then trowel in a little more than enough cold solder to fill. Let the compound set, and file flush. Use the same treatment to unite broken sections of castings. In that case hold the parts together with clamps or connecting pins while the material hardens.

When filling large gaps, start by bridging the open section with wire screening, anchored to the back of the casting with a thin coat of compound. When it is firmly bonded, build up enough thin layers of metallic paste to restore the original contour. END

Bike Wheels Make Mowing Easy

When a neighbor developed heart trouble and found his self-propelled power mower too fast, he made a simple conversion that enabled him to push easily and rest at will, complying with the doctor's orders against overexertion.

He disconnected the propulsion unit and substituted 20″ bicycle wheels with inner-tube tires for the original wheels. The large-diameter wheels provided greater maneuverability and easier control.

Forks made up of scrap pipe and elbows were drilled for the bicycle-axle bolts. They were then attached to the mower base with floor flanges and tie rods.—*Harry J. Miller, Sarasota, Fla.*

Splinters Pulled by Cotter Pin

If you run a splinter into your hand while working in a shop, you can form emergency tweezers by bending a cotter pin like this.—*Robert B. Ryan, Los Angeles.*

Perfume Traces Furnace Leak

If your furnace is a hand-fired air system, you can check for leakage of combustion gases into the ducts by throwing a small capped bottle of perfume on the fire and closing the door and all controls. If there is leakage, the smell will be noticeable upstairs when the bottle explodes.—*Stanley E. Kivela, Fond du Lac, Wis.*

ALMANAC
FOR MOTORISTS

Pithy proverbs, provident counsel and omens and portents of interest to horseless-carriage operators.

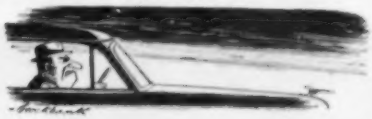
▸▸**These are the times** that try your battery's soul. Reduce heavy drain when the engine is off or idling, and keep a comfortable level of distilled water above the plates.

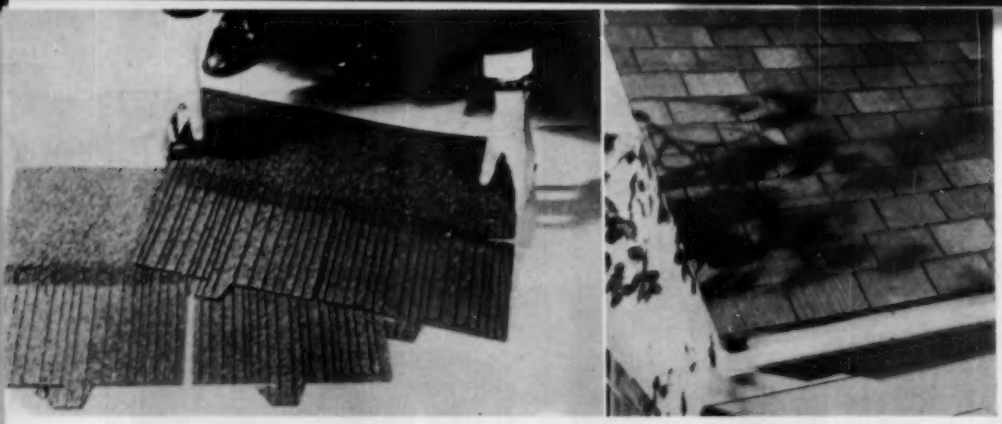
▸▸**Take a leaf** from the man who once wondered if the refrigerator light really went out. Glove-compartment door unlatched? Trunk ajar? Courtesy lights on? Will the battery be dead tomorrow?

▸▸**Take a close look** at the dipstick some morning when the engine hasn't been running for some time. If you see signs of stratification, with black oil below and a watery clear band above, it won't hurt to drain.

▸▸**Icy ruts** are wicked on front-wheel alignment. If you must travel such roads, gentle your front end by being light-fingered on the wheel and by keeping the speed down.

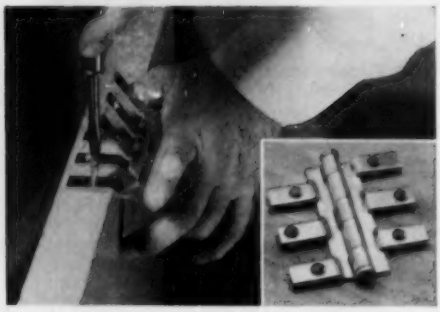
▸▸**Heater getting miserly** with its calories? If the thermostats are working right, check the heater radiator for fluff, or see if the blower-motor bearings don't need a drop of light oil.





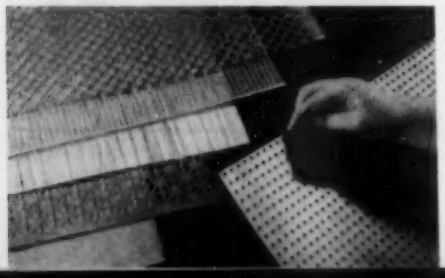
New for the Handy Man

1. Locking Shingles Resist Wind. An asphalt-shingle strip combining the interlocking feature of the familiar diamond type with the butt design favored by most home-owners is now being offered for the first time. A tab at the center of each butt locks into a slot in the shingle below, to prevent lifting. The interlock also insures fast and accurate aligning of strips and saves nails.



2. Hinge Needs No Mortising. A new type of hinge, husky enough to hold a heavy door, can be installed without cutting mortises. Screwed directly to the door edge and jamb, the staggered leaves telescope into a single thickness of metal when closed. A non-rising nib holds the pin in place. The hinge comes in several finishes.

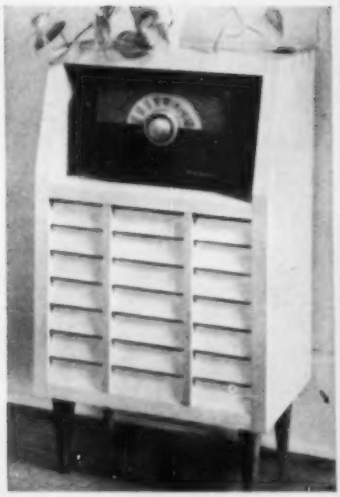
3. Aluminum Sheet Comes in New Designs. Six new types of aluminum sheeting are now being displayed at hardware stores. They include embossed and perforated designs suitable for craft projects such as radiator covers, magazine racks, trays, screen-door guards, kick plates, waste-paper baskets and ventilator grilles.



4. Shower Head Won't Clog. A light-weight shower head that won't corrode and does not allow lime to build up is being manufactured of nylon resin. It has standard threads, a shower-spread plate and shutoff valve.

5. Hinges Make Fold-Away Legs. You can make your own folding card tables, ironing boards and benches with the simplest hand tools, using ready-made hinges of a self-locking design. Once attached to the furniture, threaded holes and jamb nuts assure permanent adjustment.

Further information on the products described on this page can be obtained from: 1. Ruberoid Co., 500 Fifth Ave., NYC 36; 2. McKinney Mfg. Co., 1715 Liverpool St., Pittsburgh 33, Pa.; 3. Reynolds Metals Co., 2500 S. Third St., Louisville, Ky.; 4. Warren-Magnuson Co., 612 E. Alosta Ave., Glendora, Calif.; 5. Bostrom Mfg. Co., Milwaukee.



WHAT BURGLAR would think of looking for a safe behind what appears to be the speaker panel of this console radio? The panel is held by secret catches that are easily released by those who are in the know.

With this handsome cabinet, you double your protection against burglary loss by

Hiding a Safe in Your Home

By Glenn A. Wagner

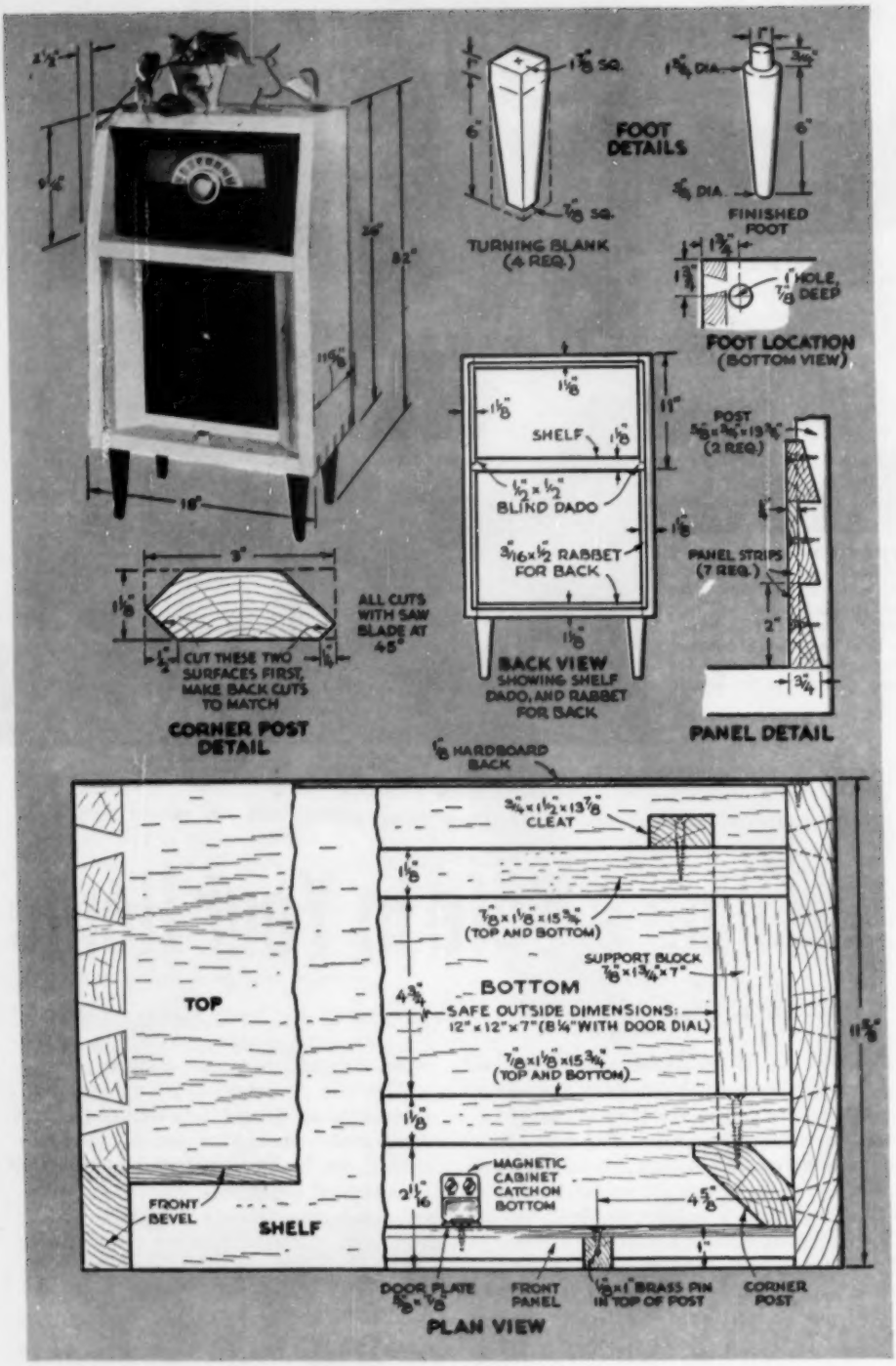
YOU can sleep soundly at night and leave home for business or a weekend with a clear conscience if your family valuables are hidden away in a secret safe.

The *pièce de résistance*—and we mean resistance—is a small, regulation wall safe built into a tailored cabinet. Such a cabinet will make a handsome console of your table radio and fit into almost any decorating scheme. Its secret-panel door will defy a burglar's search and, even if discovered, the husky safe is constructed to withstand sledges, crowbars, explosives, fire and furniture movers.

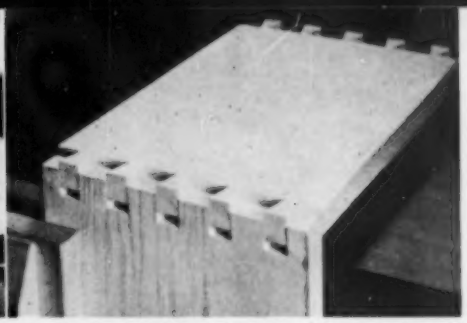
The safe is locked in by construction. Its weight combined with that of the unit itself makes the piece too heavy to be moved out bodily without attracting the attention of neighbors.

I used clear pine with black walnut legs for my cabinet. Cherry, maple, birch, mahogany and oak also work up well.

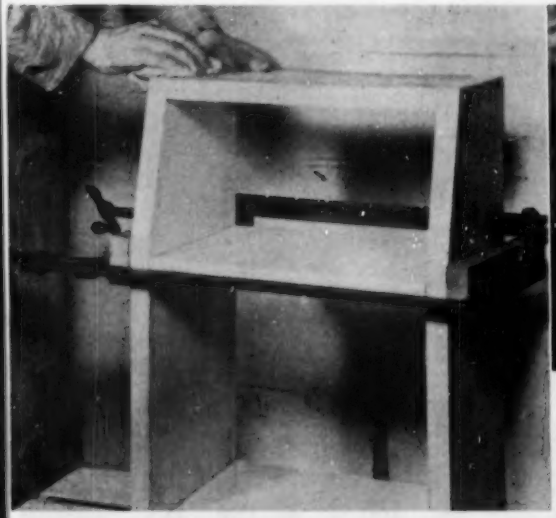
For the details of how to build the cabinet, see the following four pages.


FOOT DETAILS
TURNING BLANK (4 REQ.)
FINISHED FOOT
FOOT LOCATION (BOTTOM VIEW)
1" HOLE, 7/8" DEEP
SHELF
BLIND DADO
3/16"x1/2" RABBET FOR BACK
BACK VIEW SHOWING SHELF DADO, AND RABBET FOR BACK
POST
PANEL STRIPS (7 REQ.)
PANEL DETAIL
ALL CUTS WITH SAW BLADE AT 45°
CUT THESE TWO SURFACES FIRST, MAKE BACK CUTS TO MATCH
CORNER POST DETAIL
1/8" HARDBOARD BACK
CLEAT
(TOP AND BOTTOM)
SUPPORT BLOCK
TOP
BOTTOM
SAFE OUTSIDE DIMENSIONS: 12"x12"x7" (8 1/4" WITH DOOR DIAL)
MAGNETIC CABINET CATCH ON BOTTOM
FRONT BEVEL
SHELF
DOOR PLATE
FRONT PANEL
1/8"x1" BRASS PIN IN TOP OF POST
CORNER POST
PLAN VIEW

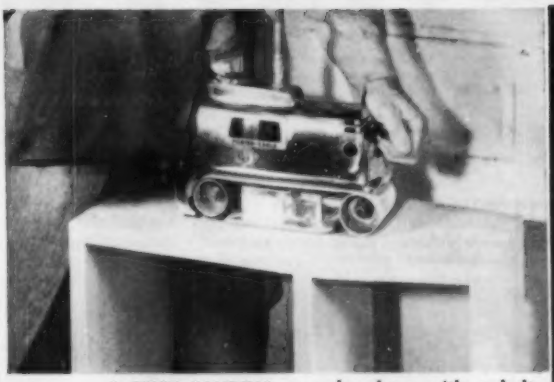
1 BEGIN CONSTRUCTION of the cabinet by laying out ½"-by-½" blind dadoes to support the shelf. Use a stop block or mark the saw table to halt the cuts ¼" from the front edge.



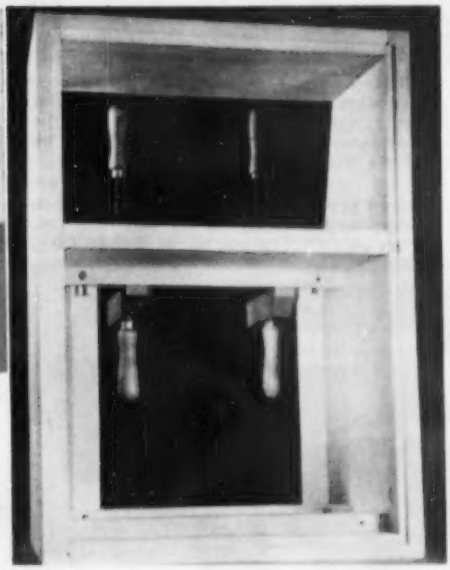
2 MAKE A TRIAL ASSEMBLY to be sure that all parts fit snugly in place. Dovetail joints are used here at the corners, but blind dadoes or reinforced butts would do as well.



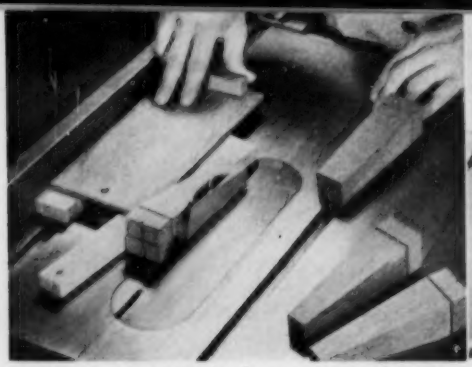
3 GLUE AND CLAMP the assembly after cleaning and sanding inside surfaces. Wipe off excess glue (left) with rag and hot water. When the glue has set, plane the outside faces true and square (above). Beveled top front edge is laid out during trial assembly to the angle of slope of the upper section of the sides.



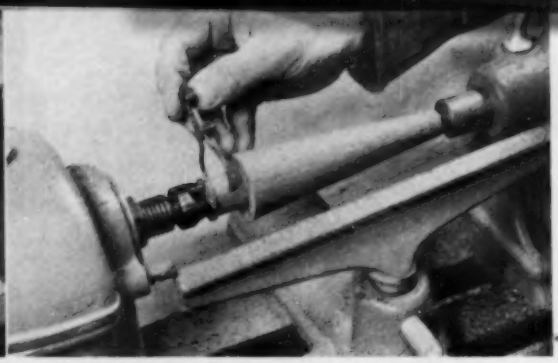
4 FIRST SANDING may be done with a belt sander, but you should finish by hand with 3/0 garnet paper. Wipe with a damp cloth and, when dry, remove whiskers with 6/0 garnet.



5 CLEATS AT TOP AND BOTTOM support the safe. The corner posts act as stops for it and the front panel. Clamp the front assembly in place and screw it to shelf and floor.

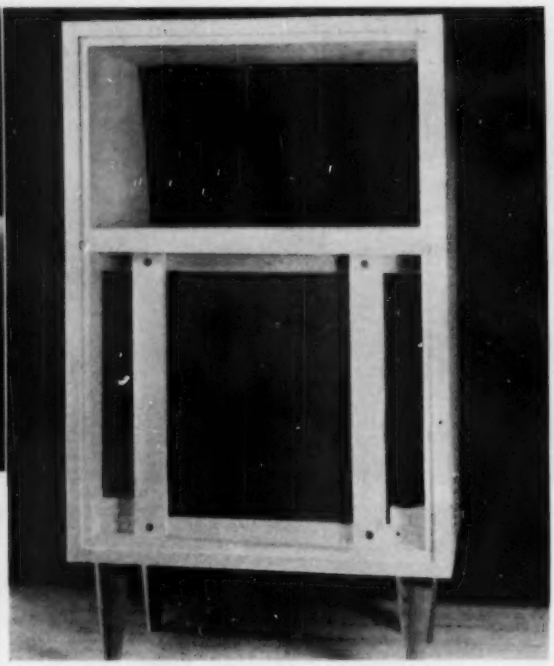


6 TURNING BLANKS for legs, sawed to length and the ends squared, are marked for centers and start of the taper. Using a taper jig, cut off excess material on the circular saw.



7 TURN THE LEGS with a tenon at one end to fit a 1" round mortise, as above. Set the calipers by measuring the diameter of the wood bit you use for boring the mortises.

8 CENTER THE MORTISES 1¾" from each edge, and bore ⅞" deep. If you cut the tenons ¾" long, a flush fit against the bottom face is assured. Glue the legs in place.

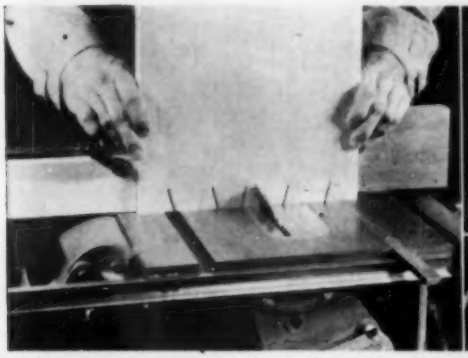


9 WITH SAFE IN POSITION (right), anchor it with uprights. Side blocks hold it laterally. Note rabbets for the back, which should be slotted for the radio cord and ventilation.

10 DADO SEVEN STRIPS for the front panel to take vertical cleats. Bevel with the saw blade set at 15°. Cut the strips slightly long, and trim to a snug fit after assembly.

11 HELD AT TOP by two ⅛" brass pins and at bottom by a magnetic catch, the panel completely hides the safe. Remove by pulling the bottom out, and then pulling down.

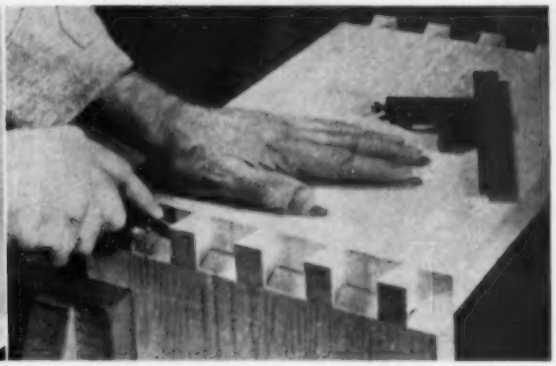
How to make a dovetail joint



MAKE THE PINS FIRST, scribing 15° angles for the sides on both faces. They should be as deep as the stock is thick. Set the saw also at 15°. Turn the work for mating cuts.

GUIDE THE END CUTS with the rip fence while supporting the work from behind with the cross-cut guide. Make all cuts in waste. You will get smooth results with a hollow-ground blade.

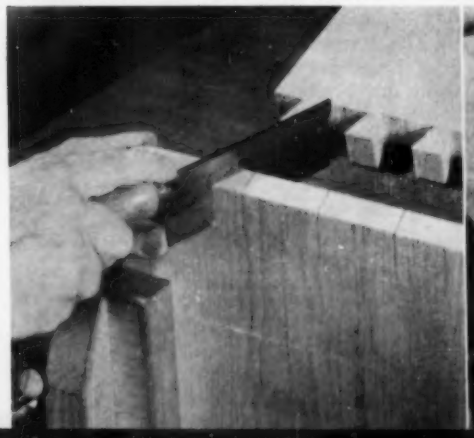
CUTTING BETWEEN PINS to remove waste is a cinch if you use a bandsaw or jigsaw. Touch up any rough spots with a chisel. Further touching up for fit is done during assembly.



WITH MATING PIECES lined up flush, scribe sockets to match the sides of corresponding pins. Using a square, scribe both faces for guide lines marking the depth of the cuts.

SOCKETS ARE CUT BY HAND with a dovetail or similar saw having fine teeth. Always cut on the inside, or waste side, of the lines and to exact depth to avoid gaps and squeezes.

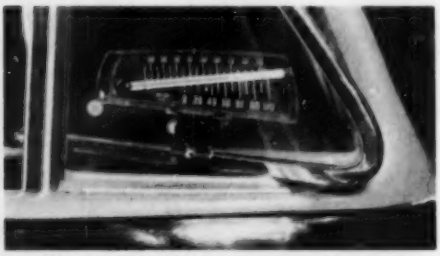
CLEAN OUT WASTE with ¼″ and ½″ chisels, working from each face. Undercut slightly toward center for a tight fit. Your dovetails should then just glide together and lock. END



New for Your Car

1. Snowplow Bolts to Car. Designed for passenger cars, this one-man snowplow can be attached and put in use in a matter of minutes. Riding on a steel shoe, it carries its own weight as the blades push snow aside. A secondary runner lifts the plow when you back. The mounting bracket is bolted to the car frame and can be left in place all winter without interfering with your driving.

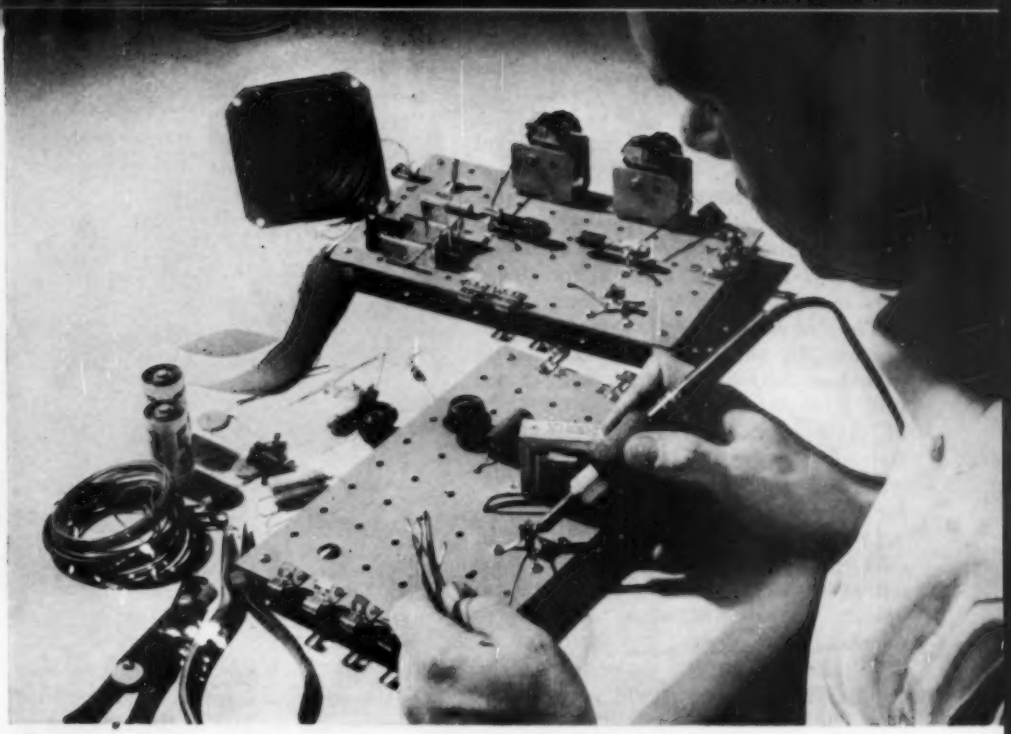
2. Tappet Feeler Saves Hands. Angled ends on this set of feelers permit gapping valves on overhead-valve V-8 engines without placing your hands near the hot manifolds. The gauge, designed for current Ford and Mercury engines, has leaves ranging from .015″ to .021″.

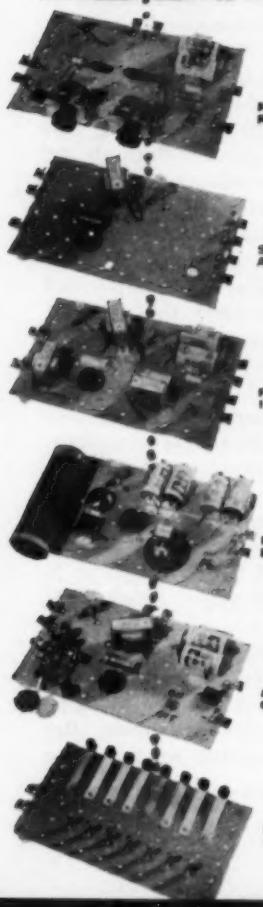


3. What's the Temperature? A thermometer outside your car will give you the correct readings of outside air temperature as you drive. It can be clipped to the vent window of any car.

4. Brake on Teen-Agers. A locking arm that prevents pushing the accelerator pedal beyond any set speed will keep teen-agers from endangering their lives in the family car. The device is bolted to the floor near the tip of the accelerator pedal, where its arm is swung into position and locked after setting for desired top speed. Unlocked, you can swing the arm out of the way for adult drivers. A sealed wire through a clip and cap screw gives you a check against tampering by the youngsters or their friends.

Further information about the products shown on this page can be obtained from: 1. Meyer Products, Inc., 3649 E. 82nd St., Cleveland, Ohio; 2. Rinck-McIlwaine, Inc., 16 Hudson St., NYC 13; 3. Taylor Instrument Co., 95 Ames St., Rochester, N.Y.; 4. Dow Mechanical Corp., Thompsonville, Conn.





Easy Hookups Show Transistor Wonders

Circuits that you can build demonstrate today's flashiest little gizmo in action.

By Howard G. McEntee

ONE way to learn about transistors is to put them to work. The six breadboard layouts at left, all within a beginner's scope, demonstrate what these midget miracles can do. You can start with one transistor and a handful of parts, and later add other elements.

For instance, the receiver can be used alone for good earphone reception; adding the one-stage amplifier will provide modest loudspeaker volume. Hooked to a record player, the two-stage amplifier puts out your favorite platter music. With a midget speaker as a microphone, it will pick up baby's least cry and relay it to the bridge table, or serve as a one-way intercom.

A later article will tell how to build a code-practice

oscillator, an electric eye, and a midget electronic organ.

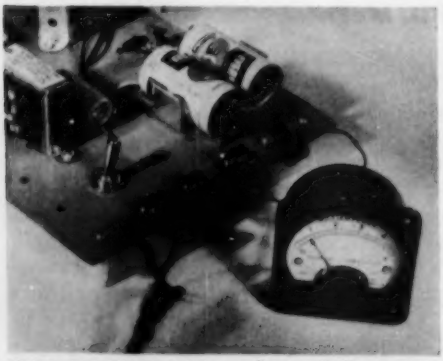
Built on pegboard panels, these units can be put together by eye. There are no holes to drill, no layouts to measure. Simply count panel holes on the drawings and mount parts accordingly.

They're here to stay. Transistors can already do almost everything vacuum tubes can, do some things better, and pull a few tricks tubes cannot match at all. At present, they are still expensive. But all the circuits shown here work with a surplus type, FS2500, available for less than two dollars each.*

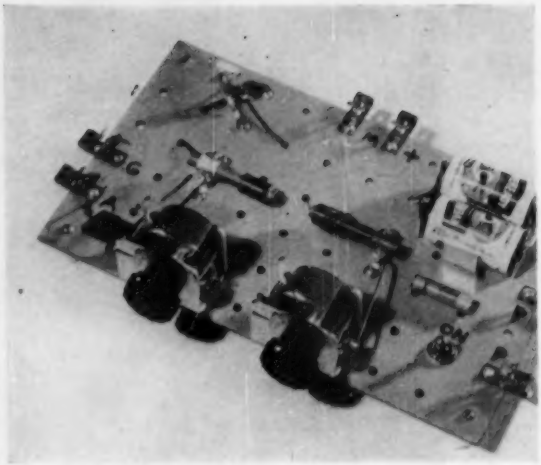
Like the early galena crystal used in cat's-whisker detectors, transistors consist of materials called semiconductors, among them germanium, silicon and selenium. The crystal detector and its descendant, the sealed diode, both used a chip of such material with a wire contact. The first transistors, called the point-contact type, were similar but had an extra cat's whisker. A later development is the junction type, in which the wire contacts are replaced by pads of transistor material cemented to both sides of a large crystal. All are, of course, sealed in metal, glass or plastic.

How do they work? Free electrons (electrons not tied to molecules) in the semiconductor travel through the material to constitute a minute flow of current. They flow more readily one way than the other, so if you connect the base and either the emitter or the collector in a circuit, you have the equivalent of the older sealed diode rectifier or detector.

**All parts, including tested transistors, sold by Federated Purchaser Inc., 66 Dey St., NYC 7.*



WHY BATTERIES LAST so long: Milliammeter on two-stage amplifier shows total draw less than one ma. If you have no meter, simply short meter clips with a wire jumper.



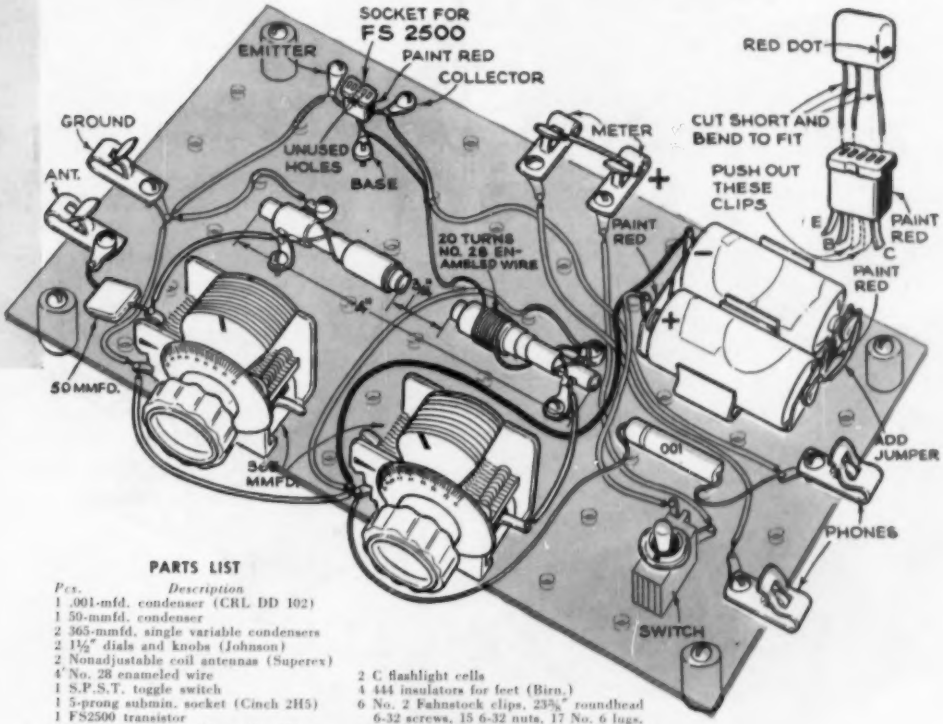
But what makes transistors immensely more important is that by applying a very small current to one contact, you can trigger a larger current through the other just as with a vacuum tube.

Electrons and holes. In manufacturing transistor material, the germanium or other element is first purified, and then tiny amounts of selected impurities are added. These convert the material either to one with extra electrons (called N type, for negative) or to one with insufficient electrons (P type, for positive). In this latter, a molecule lacking an electron steals one from its nearest neighbor, which in turn steals one from the next in line, and so forth, so that the "hole" travels just like an electron. A typical junction transistor will have a layer of P material sandwiched between two of N material. The FS2500's are of this NPN type.

With vacuum tubes, the triggering potential (input) is fed to the grid and filament; the output is through filament and plate. In the circuits shown, the transistor base compares to the tube

[Continued on page 262]

Receiver Makes the Air Waves Talk



PARTS LIST

Pcs.	*Description*
1	.001-mfd. condenser (CRL DD 102)
1	50-mmfd. condenser
2	365-mmfd. single variable condensers
2	1½" dials and knobs (Johnson)
2	Nonadjustable coil antennas (Superex)
4'	No. 28 enameled wire
1	S.P.S.T. toggle switch
1	5-prong submin. socket (Cinch 2H5)
1	FS2500 transistor
1	Case for 2 C cells (Acme No. 10)
2	C flashlight cells
4	444 insulators for feet (Birn.)
6	No. 2 Fahnstock clips, 23/32" roundhead 6-32 screws, 15 6-32 nuts, 17 No. 6 lugs, 6"-by-10" pegboard base.

LITTLE more complicated than a crystal set, this receiver has good earphone volume. Two loose-coupled tuning circuits separate even strong local stations. You will, however, require a good antenna. Where phone wires are strung on poles, good reception can be had by connecting the antenna clip to any bare metal on a telephone.

Mount the ready-wound coils (sold as loop antennas for superhet receivers) by soldering their terminal lugs to bolts set in the panel. Push the iron cores of the coils just flush with the facing ends (be careful not to lose either).

Leave the emitter disconnected at first. Temporarily connect the plus and minus terminals on the battery case, with no cells in it. With the switch on and a jumper across the meter clips, you should get reception, the transistor working like an ordinary crystal diode.

Now ground the emitter, disconnect the case terminals, insert two dry cells correctly (center posts toward red marks on case), and listen to the difference with the transistor working as a triode!

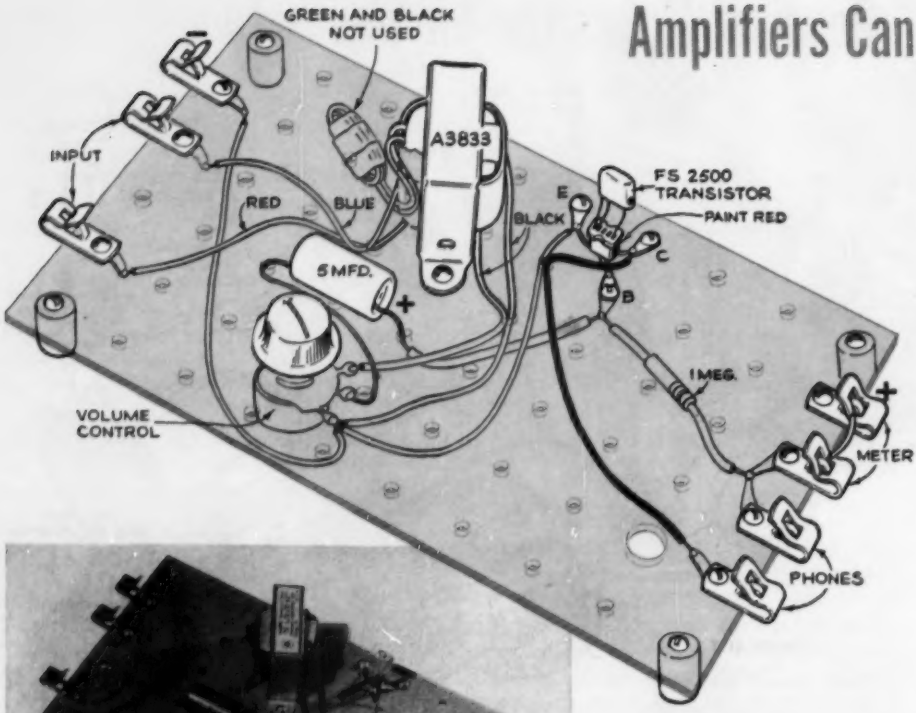
A meter should read less than .1 ma. The condensers should tune to approximately the same dial setting. If strong stations overlap, reduce coil coupling by pushing both cores a trifle farther in.

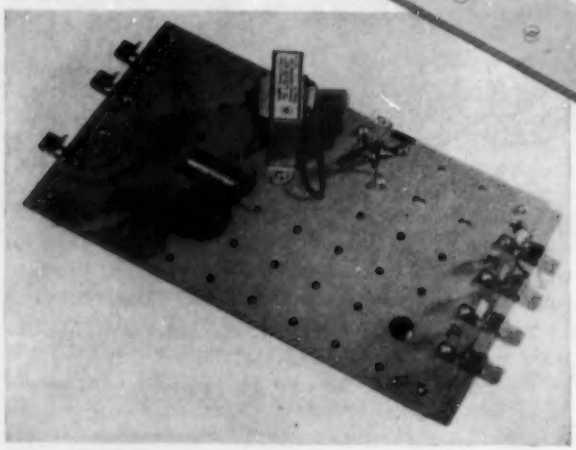
If stations in your area are far apart on the dial, coupling may be tightened by pulling the cores out, with some gain in pickup. For still more volume, connect the amplifier shown on the next page.

Disconnect the antenna when the set is not in use, for in thunderstorm seasons static may damage the transistor.

Please turn the page for more on transistors

Amplifiers Can





PARTS LIST

Pcs.	*Description*
1	5-mfd. 25-volt electrolytic condenser
1	1-meg. ½-watt carbon resistor
1	Input transformer (Stancor A-3833)
1	5-prong submin. socket (Cinch 2H5)
1	10,000-ohm volume control
1	FS2500 transistor
4	444 insulators for feet (Birn.)
7	No. 2 Fahnstock clips, 16 ⅜" roundhead 6-32 screws, 12 6-32 nuts, 10 No. 6 lugs, 6"-by-10" pegboard base, small knob.
	Optional
1	Output transformer (Stancor A-3848)
1	4" PM speaker

HOOKED to the receiver, this single-stage amplifier will work a small permanent-magnet speaker on local stations. It needs no batteries of its own, but draws power from the receiver.

The input transformer specified was designed for another purpose, so one winding is not used at all. Simply tape both leads off separately, not joined.

Connect the input terminals of the amplifier to the phone clips on the receiver, and the plus and minus clips to the corresponding ones on that unit. If a meter is connected, it should show from .1 ma. to no more than 1 ma. Should it read more than this, substitute a higher value for the 1-meg. resistor specified.

Connect phones directly to the output terminals. A speaker, having a much lower impedance, should be connected through an output transformer as shown on the facing page. This can be mounted on the chassis, with the input leads left free so that they can be inserted in the clips in place of phones, or disconnected when phones are used.

For maximum volume, mount the speaker in a cardboard carton or on a foot-square baffle of plywood or fiberboard.

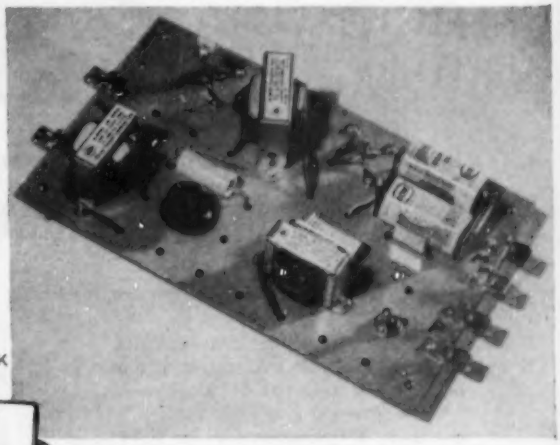
Be Used to Detect Sounds or Boost Volume

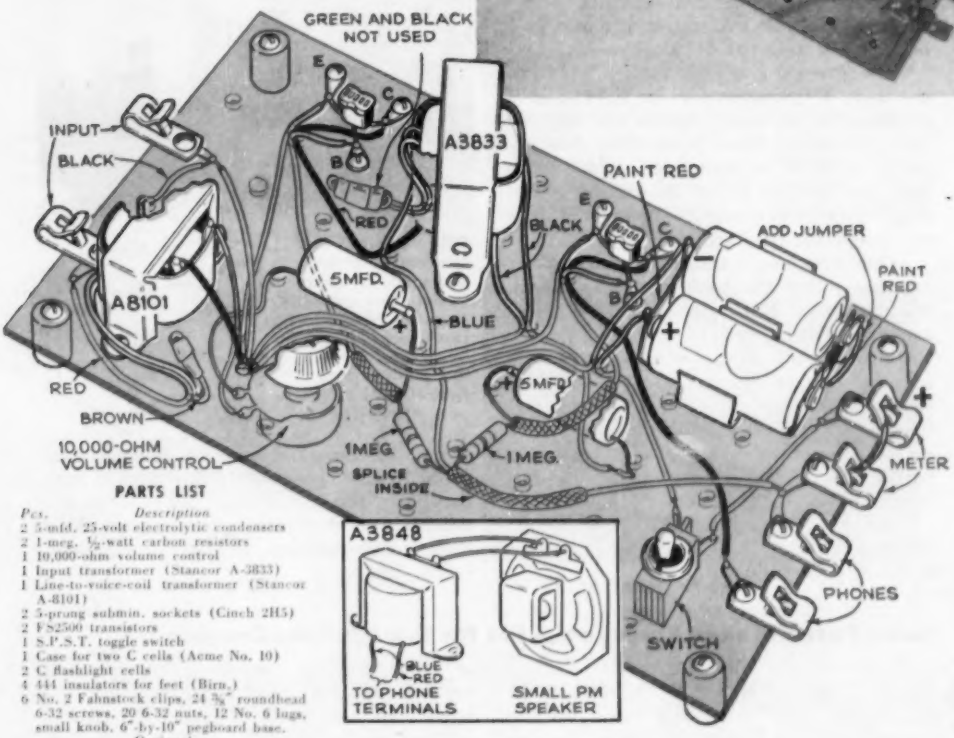
TWO stages of audio amplification make this rig a phonograph amplifier, intercom, baby listener or detectaphone.

To pick up air-borne sounds, a 4" PM speaker is used as a microphone. It has excellent sensitivity; when phones are used to listen with, even whispers can be heard. With a second speaker at this end, connected as described for the single-stage amplifier, the unit can be used as a stand-by intercom between house and workshop or garage, or to relay baby's cries from the nursery to the living room. The mike can be several hundred feet from the amplifier.

If you have a meter, insert one transistor at a time to check the current that each draws. If it is more than 1 ma., change the 1-meg. resistor in that stage.

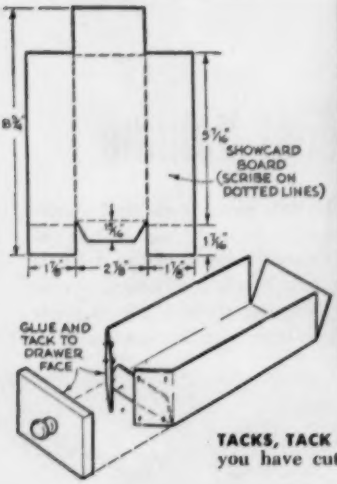
With a phono pickup, use a second A-3833 transformer instead of the A-8101. Connect the two black leads to the volume control. Try the pickup across each of the other two windings for best results.

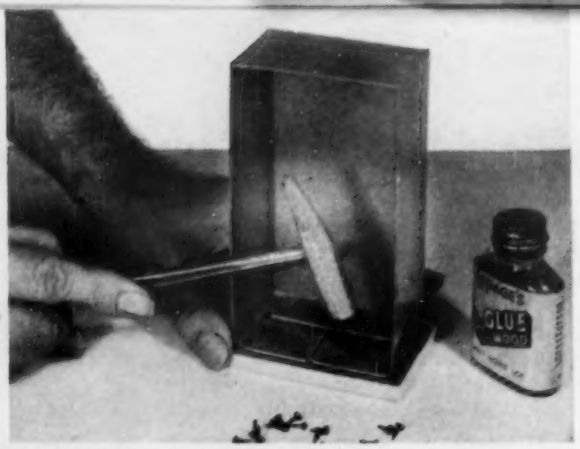




PARTS LIST

Pcs.	*Description*
2	5-mfd. 25-volt electrolytic condensers
2	1-meg. ½-watt carbon resistors
1	10,000-ohm volume control
1	Input transformer (Stancor A-3833)
1	Line-to-voice-coil transformer (Stancor A-8101)
2	5-prong submin. sockets (Cinch 2H5)
2	FS2500 transistors
1	S.P.S.T. toggle switch
1	Case for two C cells (Acme No. 10)
2	C flashlight cells
4	441 insulators for feet (Birn.)
6	No. 2 Fahnstock clips, 24 ⅜" roundhead 6-32 screws, 20 6-32 nuts, 12 No. 6 lugs, small knob, 6"-by-10" pegboard base.
	Optional
1	4" PM speaker
1	Output transformer (Stancor A-3848)





TACKS, TACK HAMMER AND GLUE are all you need to make the drawers once you have cut the cardboard flats to correct size, scored and folded them.

Want a simple hammer-and-scissors job? Try

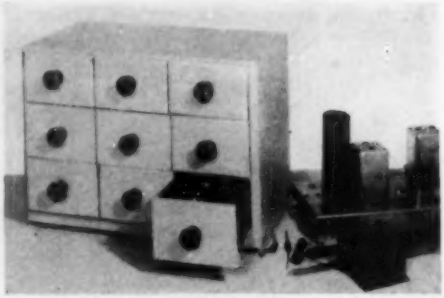
Making Drawers from Cardboard

A NOVICE can build this small-parts cabinet. The key to its simplicity is cardboard drawers. You trim them to a smooth-sliding fit with either a matte knife or a pair of scissors.

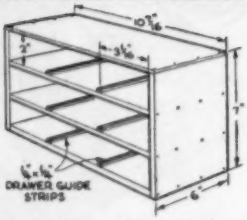
Make the cabinet first, using 1" pine for the base, ¾" plywood for the sides, and ¼" plywood for the back, shelves and top. Before assembling these parts with glue and brads, attach ¼"-square strips of pine to the base and shelves to act as drawer guides. Four rubber feet complete the cabinet proper, except for painting.

While you may want drawers of a different size, follow the basic pattern shown in the drawing. A tin template will speed accurate cutting but isn't necessary. Use showcard board, available at all art stores, for the drawer stock. After cutting the required number of "flats," score them where folds are indicated with dotted lines, using a sharp knife and taking care not to cut too deep. The scoring insures accurate bending and sharp corners.

Fold away from the scored side and reinforce all joints and folds with binding strips of wide cellulose tape.



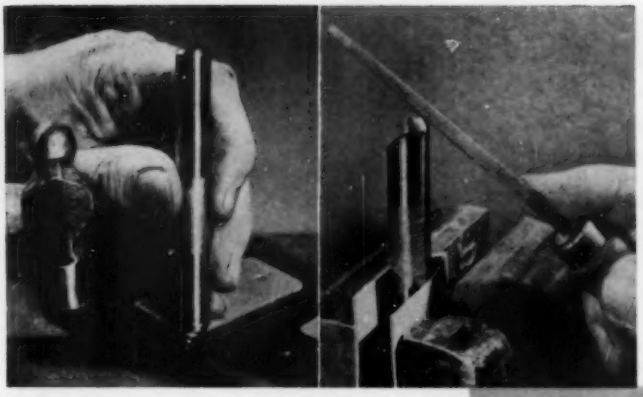
THIS CABINET of cardboard drawers was made to fit between two workshop shelves. You can make it larger, but if you increase the size too much, rigidity and sturdiness will suffer.



Finally, glue and tack an oversize face made from ¼" plywood to the front of each cardboard box and attach drawer pulls. For a finished result paint the drawers, or at least their outside surfaces, to match the cabinet. —*Eric Adams.*

Tube Patch Makes Emergency Fix for Car Ignition Trouble

WHEN my car conked out miles from a garage, I quickly traced the trouble to the distributor. The insulating fiber on the breaker arm had broken off, letting the arm short to the cam. Cutting a ¼"-by-¾" strip of tube-patching rubber, I cemented it around the arm, oiled the cam, reset the spark gap, and made it home—150 miles—without further trouble.—*Edwin Kirchuber, Franklin Square, N. Y.*



NEW Shop Ideas

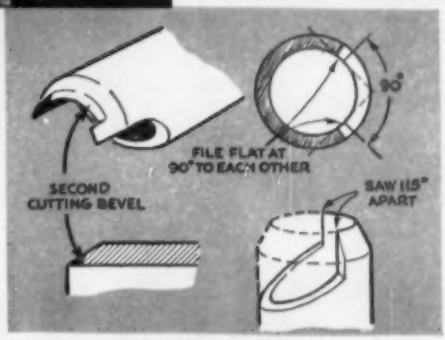
A SECOND BEVEL filed between the guide fingers forms the corner-cutting edge. The tool shank may be knurled or wrapped with tape for a good grip.

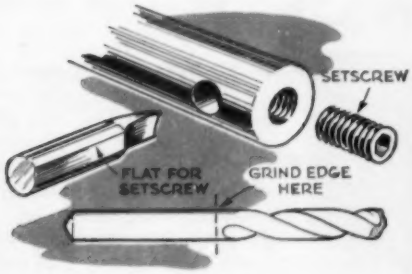
Corner Punch Aligns Itself. Making neatly rounded corners on cardboard, fiber, and soft sheet metal is easy with this punch. When placed against the edges of the work, it is automatically positioned. Each corner will be rounded exactly alike.

In one end of a piece of drill rod, drill a hole of the desired cornering radius and about ¾" deep. File or turn an outside bevel as for a hollow punch. Make two saw cuts 115° apart and about ¼" down from the end. Then cut from the side, removing all but the 115° segment.

In this, file a 90° section about 1/16" deep, leaving two projecting fingers. File the insides of these flat to form a right angle. Then file a secondary bevel between to form the radius-cutting edge.

Harden both ends of the punch and draw the upper end to light purple and the lower to a light straw. Dress the edges with a fine stone, leaving the guide fingers sharp to penetrate the cardboard or other underlay on which the work is to be cut.—*Walter E. Burton, Akron, Ohio.*





Drill Yields Boring Bit. When a special boring bar is needed, you can skip making a square hole by grinding the bit from a broken high-speed drill. Shape the cutting edge at that part of the shank where the flutes run out; it is hard and will hold an edge. Drill a hole the same size in the bar.—*M/Sgt. James R. Wood, NYC.*

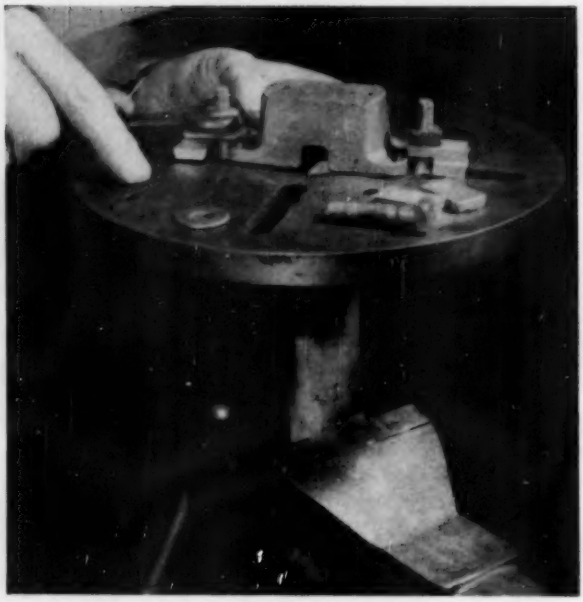
Oil Conditions Stones. If you store sharpening stones in a covered pan kept full of kerosene, they will always be clean and ready for use. The oil soaks out imbedded grease and metal particles, making the stones cut faster, wear more evenly, and put a smoother finish on edges.—*H. L. Luckett, San Antonio, Tex.*

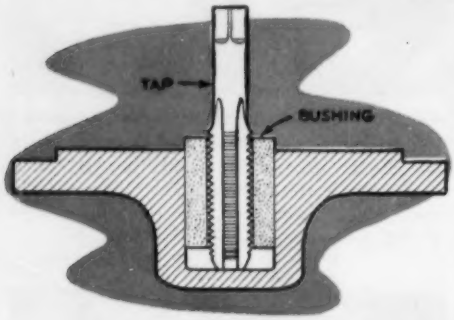
Please turn the page for more shop tips

MORE SHOP TIPS

Easier Faceplate Mounting. With the faceplate horizontal instead of vertical, you needn't be a juggler to mount multi-pieced work, or jobs that call for loose packing pieces. A wooden fixture holds the faceplate in the vise at a handy height.

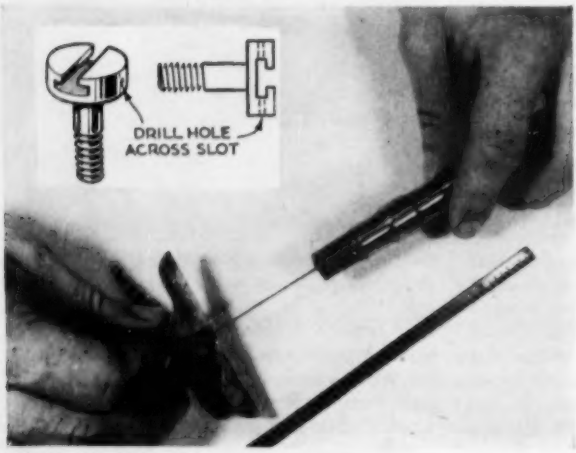
File opposite flats on a 6" length of 1½"-diameter hardwood for clamping in a vise. Turn down the other end, if necessary, until the faceplate can be screwed on, cutting its own threads. Held as shown, it can be rotated at your convenience, and there is clearance under it for inserting bolts.—*Joseph Tracy, NYC.*





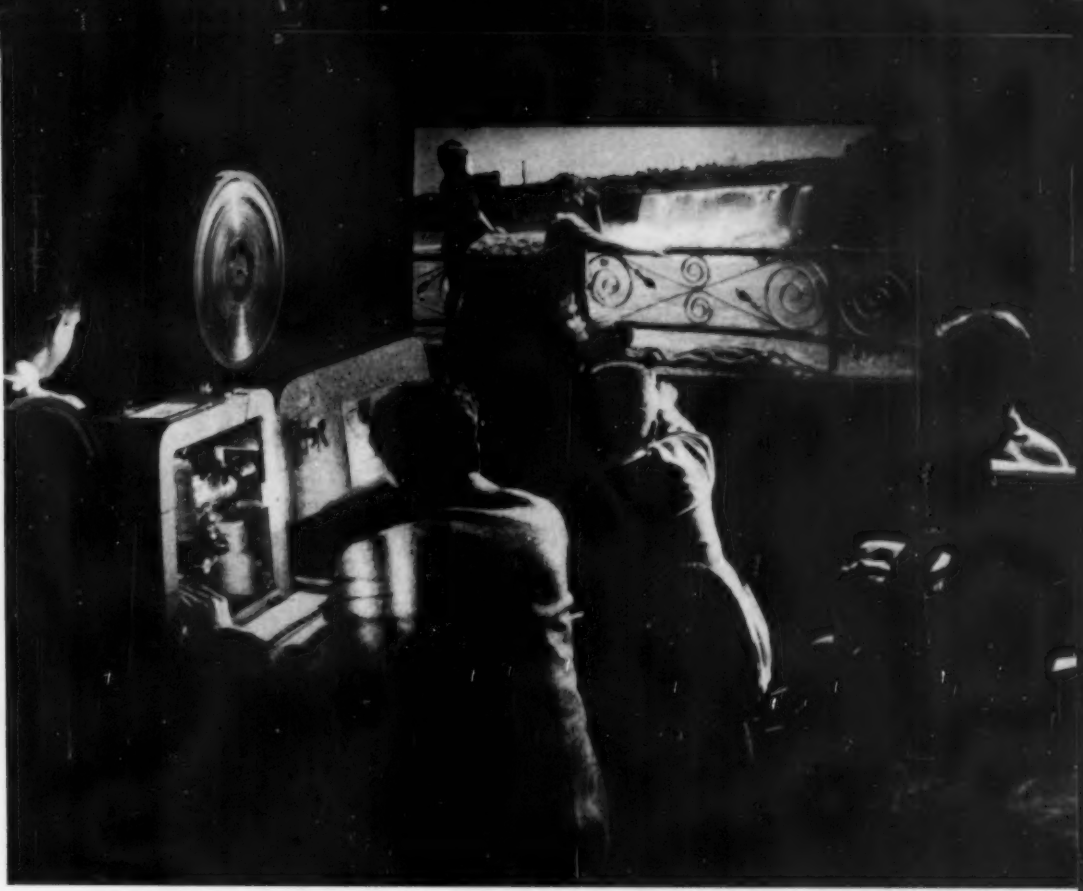
Pulling Blind Bushings. To remove worn bushings from blind holes, as in auto starters and generators, simply screw in a tap of suitable size. Any tap that will cut threads in the bushing will do. When it bottoms in the hole, the bushing will be forced out, if twisting stress doesn't free it first.

To Tap Edge Holes in sheet plastic or other brittle stock, clamp it in a vise with the edge flush with the top of the jaws. So backed, the sides will not break through.



Small-Hole Depth Gauge. A rule depth gauge is limited in use to holes that will admit the blade. But I converted mine to gauge holes as small as 1/16". It took only minutes, and didn't affect the tool for ordinary use.

All that's needed is to drill a 1/16" hole in the slotted clamping head, crosswise of the rule-holding slot. Insert a 6" length of straightened steel music wire in this. Gauge holes with the wire, and then measure its projecting length with the rule.—*Phil McCafferty, Stanwood, Iowa.*



New wide-screen systems enable amateur to capture boy at left (on screen) and all of falls.

Wide-Screen Movies Come to the Home

New lens attachments that fit both your camera and projector squeeze Hollywood scope and realism into home-movie film.

By Herbert O. Johansen

PHOTOS BY W. W. MORRIS

ONE evening as we came out of the neighborhood theater after seeing a CinemaScope feature, a friend invited me to his house to look at some of his 16-mm. homemade movies.

He had some good family action stuff —a Fourth-of-July picnic with a lot of fancy fireworks, a parade in which Joanie was a majorette leading the school fife-and-drum corps, the kids in a snowball fight. But after the wide-screen movie we had just seen, his square projections looked flat and lifeless. I frankly said so.

"Yes, I know," my friend agreed. "If I could only get on my film what I actually see while I'm shooting—that would be something!" A faraway look came into his eyes as he added, "Well, maybe someday amateurs like myself will get wide-screen movies."

"I got news for you, pal," I told him. "That day has come."

"Sure, I know," he said. "If I could af-

NORMAL 16-mm. movie frame, in blowup, looks like this. The young lady leaning comfortably against the rail of a round-Manhattan Island sight-seeing boat has a nice skyscraper background. It is what the camera "saw" and what you would see on your home-movie screen.

SQUEEZED image of the same scene as above, but taken with a wide-picture lens attachment, looks like this. The Stars and Stripes gets into the picture—and there's lots more skyline background on either side, too. This distorted image, of course, is not what you would see on the screen during projection.

ford professional Hollywood equipment and had the back of a barn for a projection screen."

"That's where you're wrong. You can get a lens attachment right now that will give you wide-screen 16-mm. movies. It's FilmoRama, just put out by Bell & Howell. And there's another one, Vistascope, imported from Holland. That one comes in two sizes, one for 16 mm. and another for 8 mm."

"You mean I actually can take movies like CinemaScope?"

Same Principle and Lens as Pro Jobs

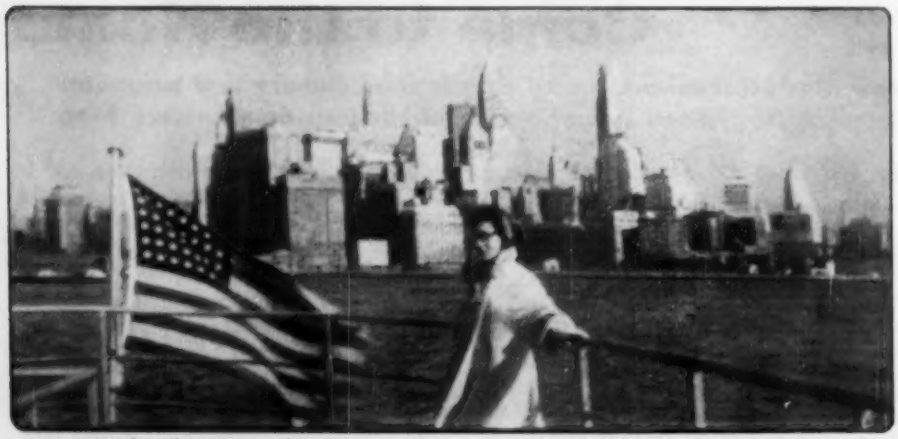
"As a matter of fact, FilmoRama works on the same principle as CinemaScope, which was developed and made by Bell & Howell."

"Yes, but what about showing what I took?"

"Same lens attachment," I told him. "Use it on your camera while shooting, then put it on your projector. Like the professional jobs, these are anamorphic lenses."

"Anamorphic? What's that?"

"Anamorphic," I explained, "means that they see to the sides as well as straight ahead, taking in a wider scene—more like what the human eye sees. Then they squeeze the wide view onto the film. When you use the FilmoRama or Vista-



UNSQUEEZED by the anamorphic lens attachment used in front of a standard projector lens, the distorted image becomes a realistic wide-screen picture. The new lenses see more, show more. All three photos on this page were reproduced from actual 16-mm. film.

ONE OF THE FIRST FilmoRama lens attachments was taken to the Arctic last summer by POPULAR SCIENCE photographer Bill Morris. It was then so new that there were no instructions available on how to use it. At left Bill is shown getting ready to shoot the U.S. Coast Guard icebreaker *Eastwird* as it cracks a path through the thick polar ice pack. The photograph above shows what his wide-picture camera eye saw.

scope attachments on your projector, the process is reversed, and the squeezed, distorted image is unsqueezed.

"With FilmoRama you get a picture almost three times as wide as it is high. Vistascope gives you 50 percent more horizontal coverage. You'll need a wide projection screen, of course, but it doesn't have to be curved."

"Sounds like the stuff all right," said my friend. "What's the price tag?"

"Depends on which one you want. The FilmoRama wide-screen lens attachment is $596. Then you need special mounting brackets, one for your camera and another for your projector. Also, you must have a special wide-field view finder. That adds up to a $760 package."

"What about that other one?"

"Vistascope. Well, there aren't any special mounting brackets. You just use a standard sunshade-adapter ring. And, right now, there is no wide-field view finder for it—you sort of by-guess and by-gosh."

"I gather that the price is lower?"

"It's cheaper, yes. The 16-mm. job is $125 and the 8-mm. one $75. Anyway, those are the prices that I got from the people who import them—J. L. Galef and Sons in New York, down at 85 Chambers Street."

"That does give me a choice. But say, do these wide-screen home movies really work? Have you seen any of it?"

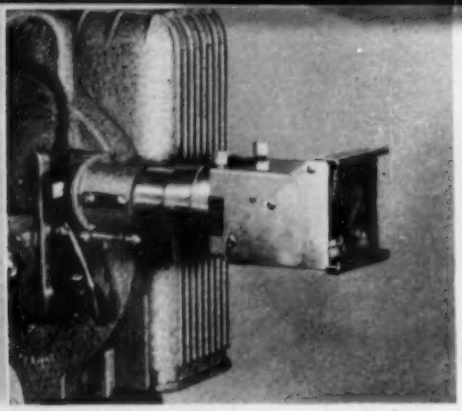
New Systems Give Sense of Depth

"Both systems," I told him. "Not only do you get wide pictures on the screen, but you actually get a sense of three dimensions. Let me give you an instance. When Bill Morris, the chief photographer of POPULAR SCIENCE, and I were up in the Arctic last summer, he took along a FilmoRama lens attachment for his Bell & Howell 16-mm. movie camera.

"We were showing the film at the office the other day. When we came to a sequence taken from the bridge of an icebreaker pitching in heavy seas off Greenland, one of the guys asked if there was a Dramamine tablet in the house. He was getting seasick."

Please turn the page to see how the two systems work

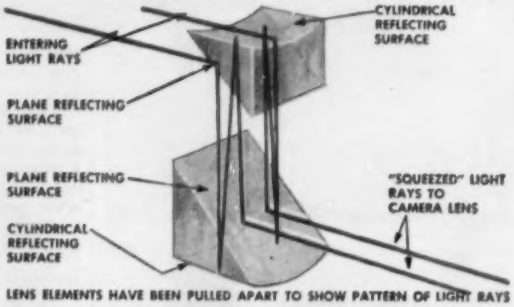
FOR TAKING PICTURES, Vistascope lens is attached in front of the camera lens. It fits a standard adapter ring, used for sunshades.



FOR PROJECTING Vistascope movies, the lens attachment is removed from the camera and mounted in front of the regular projector lens.

How Vistascope works

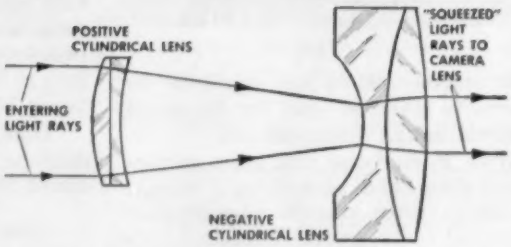
VISTASCOPE uses the curved reflecting surfaces of prisms to put on the squeeze that fits wide-picture scenes on narrow 16-mm. or 8-mm. movie film. Its light-bouncing system is shown in optical diagram at right. When the same lens is put on a projector, the distorted image is unsqueezed and projected as a wide-screen picture.

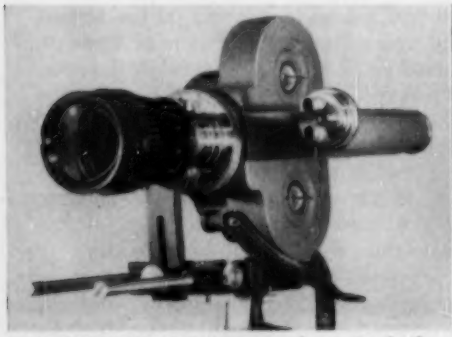


LENS ELEMENTS HAVE BEEN PULLED APART TO SHOW PATTERN OF LIGHT RAYS

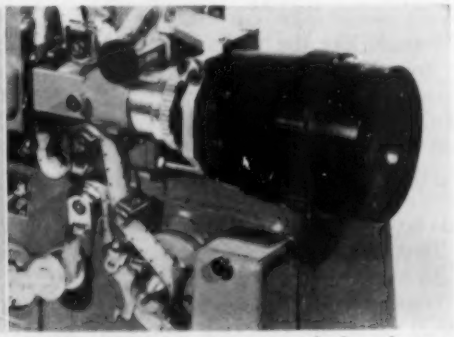
This is the FilmoRama way

FILMORAMA achieves its 16-mm. wide-picture-taking squeeze and wide-screen-projection unsqueeze by refraction, as shown in the optical diagram at right. Instead of being reflected, the light rays are compressed for taking, or magnified for projection, as they pass through cylindrical lens elements of the anamorphic attachment.





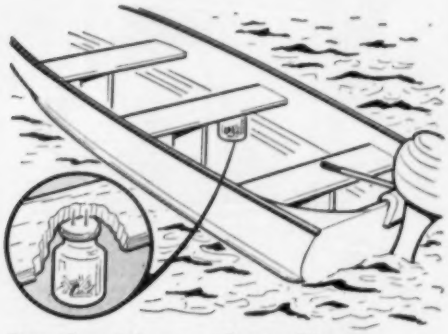
MOUNTING BRACKET is required to attach the FilmoRama lens to a 16-mm. movie camera. A special wide-field view finder is also available.



SAME FILMORAMA LENS is attached to the projector to show wide-screen home movies. A special mounting bracket is needed here, too.

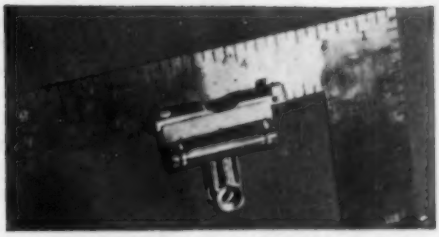
Mirror Cures TV Stiff Neck

WITH the TV set directly behind me as I worked at my small shop in one corner of our apartment living room, I found myself suffering from a constant stiff neck. But no more. I mounted a 9"-by-12" mirror above the bench and higher than the bench light, and now watch TV while I work.–*Henry Hollwedel Jr., El Paso, Tex.*



Dry Spot for an Open Boat

SMALL items such as matches and cigarettes can be kept dry yet within arm's reach in an open boat if you store them in a small screw-top jar attached to the underside of one of the seats. Two small screws through the jar cover will hold the container securely in place.–*Roger M. Woodbury, Natick, Mass.*



Level Double-Checks Work

CLAMP a small line level on the inner edge of a framing square to tell at a glance if your work is level or vertical as well as square. Be sure the level is parallel with the edge of the square and, if possible, check it with a carpenter's level before relying on it altogether.–*Gilbert C. Close, Hawthorne, Calif.*

Can Turned into Ash Tray

IT'S easy to convert a conical-top beverage can into a shop ash tray. Place the can under a mechanic's press or between the jaws of a vise, and then apply pressure. The top will pop inward, giving a funnel opening for the ashes as shown in the photo at the left.–*J. P. Stechschulte, Columbus Grove, Ohio.*

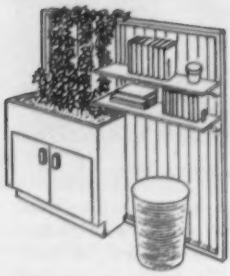
Water Weights Boat in Storm

WARNED that a hurricane was approaching, I faced the problem of safeguarding my plywood boat, resting on a trailer in the back yard. Using the garden hose, I quickly ran enough water into the boat to hold it down.–*I. L. Saltz, Pikesville, Md.*

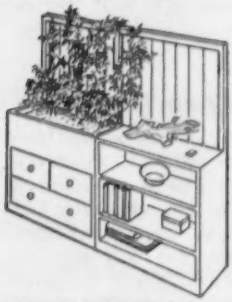
Shoehorn Arm Aids Old Folks

ELDERLY people, or those who find it difficult to stoop, will appreciate this extension shoehorn. Smooth a thin strip of hardwood and attach it to the end of the shoehorn with flathead screws or rivets, countersunk. Finish the hardwood strip with varnish or wax.–*Frank Shore, NYC.*

How to Turn One Room into Two



BASIC DESIGN can be varied as you wish.



DRAWERS IN CASE require increased depth.

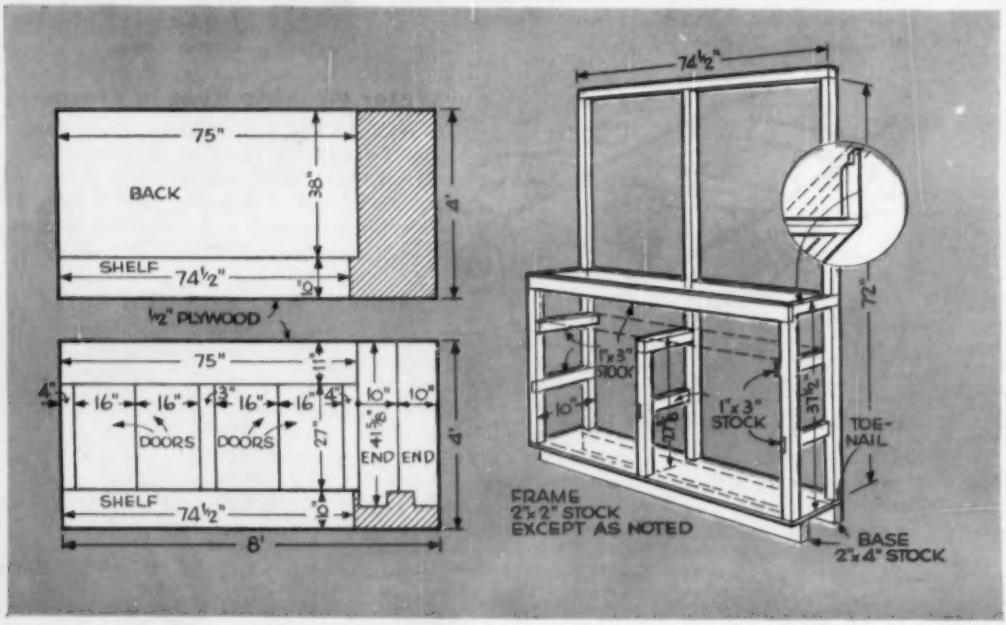
Combination cabinet and plant stand provides needed separation for a dual-purpose room.

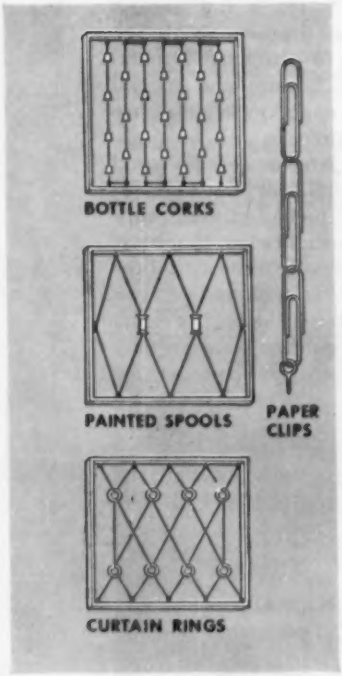
By Carl T. Sigman and William J. Ward Jr.

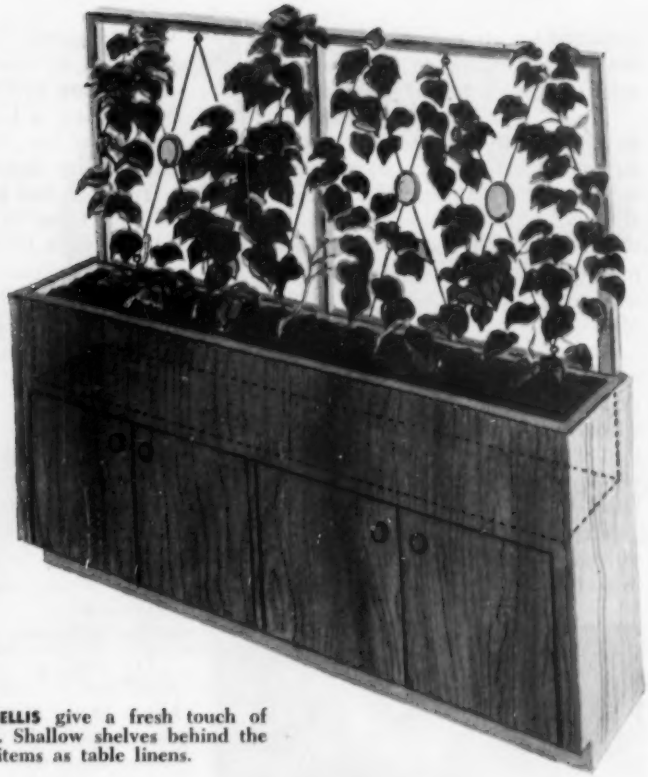
DUAL-FUNCTION spaces in modern homes frequently call for room dividers to separate the dining alcove from the living room or kitchen, a family room from a more formal living room, and the like. These well-lighted, wide-open areas are not disturbed—their attractiveness may even be enhanced—by a well-designed divider that you can build with the simplest tools.

Following a basic design, you can make a room divider to your own taste by combining a shallow storage cabinet and plant stand that contains a rustproof copper or galvanized plant box. The lady of the house can train philodendron or other hardy vines to grow over the trellis which is made of heavy colored cord strung through screw eyes. Cork floats, bottle corks or painted spools among other things can be used to decorate such a trellis. You can make up an unusual trellis with paper clips.

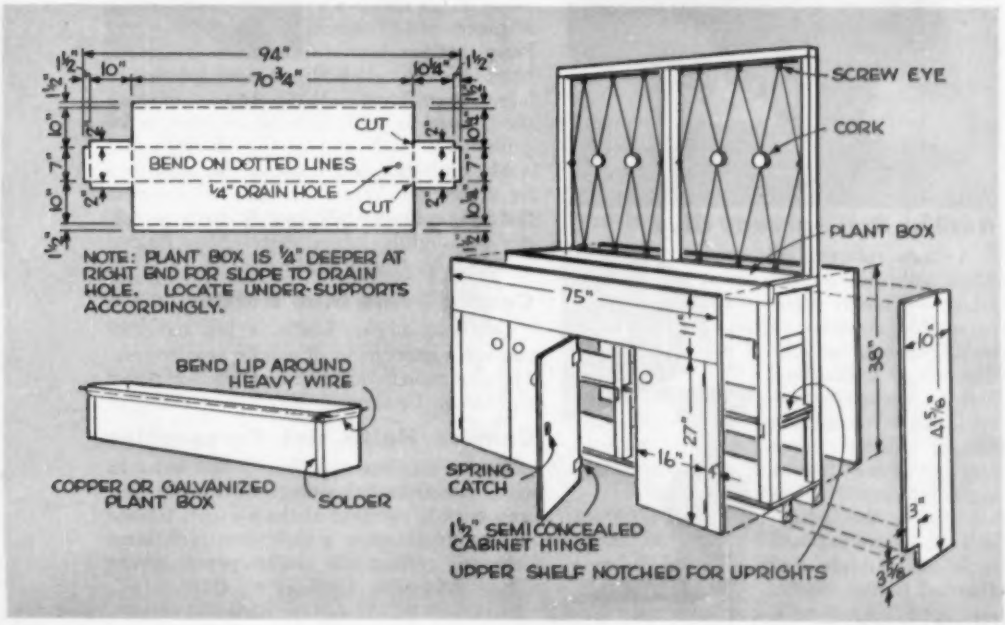
Dimensions shown are not critical, but were chosen to allow the front and back and two shelves to be cut from two standard 4′-by-8′ plywood boards. If greater length is







VINES ON A DECORATIVE TRELLIS give a fresh touch of outdoors to this room divider. Shallow shelves behind the cabinet doors can store such items as table linens.



required for your room, you can increase that dimension up to 10″ and still have sufficient stock to cut out the ends.

The 2″-by-2″ frame is heavier than that ordinarily required for similar construction, but it gives an appearance of substantiality to the trellis and may add that extra stability necessary to prevent the household tragedy of an upset. You may even find it desirable to attach the separator to the floor and wall with unobtrusive metal angles.

Any plant box requires drainage. This may be achieved by punching a ¾″ hole near one end of the bottom to take off surplus water, and tilt the box toward that end. Punch from the inside to provide a spout that will keep the water from running along the edges, and place a pitcher or other vessel under the spout at least during watering. Put pieces of broken flowerpot over the hole to prevent clogging; then cover the bottom with 1″ of coarse drainage material.

You may prefer to purchase a metal box having a false bottom and special provisions for drainage, in which case change the dimensions to suit.

You will find ½″ interior A-B plywood for the faces of sufficient thickness to add strength to the toenailed joints supporting the rear uprights on the base. It has one finished side that will take paint. If your room is wallpapered, you may wish to cover the inside of the doors with a matching paper, or a fabric may be glued on. Hardboard would be equally satisfactory, or you can make the faces of redwood, cypress or cedar.

Since your separator very likely will be used with one end against a wall, the facepiece is eliminated at that end. The frame should be cut to fit if it is to go against a baseboard.

Rubber Ball Spreads Glue

A SLIT rubber ball filled with glue or mucilage is a handy applicator that contains its own generous supply. The slit is self-sealing, and yet it is easily parted to apply a uniform film of adhesive when you give the ball a slight squeeze. A glass ash tray or the bottom half of a paper cup will make a holder.—*Ken Murray, Colon, Mich.*

How to Make a Nail Carrier

YOU can use baby-food jars to make a handy carrier for nails, screws and the like. Using an expansion bit, drill holes 1″ deep the diameter of the jars in a piece of 2″ stock. Press the jars into the holes. For handles, bend two pieces of heavy wire to a wide U shape and snap the turned-in ends into a pair of holes drilled into each end of the block.

My husband used eight of the small jars for the carrier. When our baby advances to the Junior foods, he plans to make a carrier for slightly larger parts.—*Mrs. Roland E. McCune, Harvard, Mass.*

Candle Seals Glue Bottle

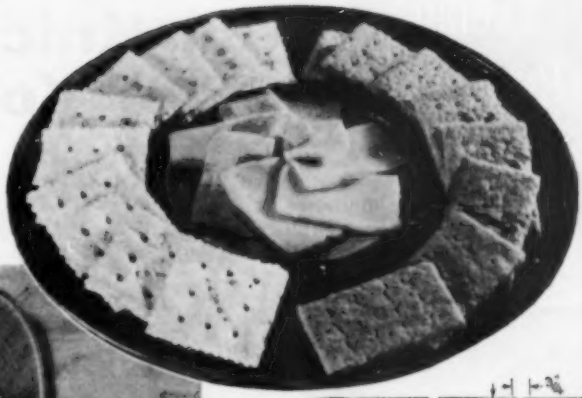
OPENING a glue bottle is lots easier if you use a short piece of candle as a stopper. The glue won't stick to the candle.—*Howard E. Moody, Upper Jay, N.Y.*

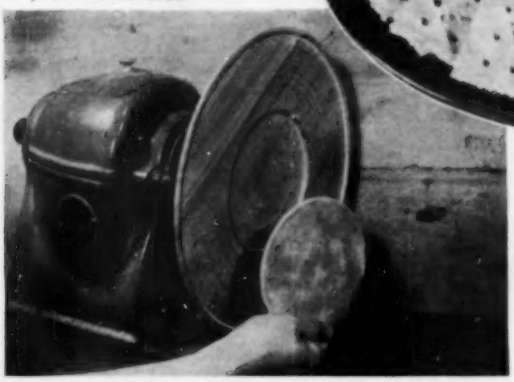
Camera Helps Get Perspective

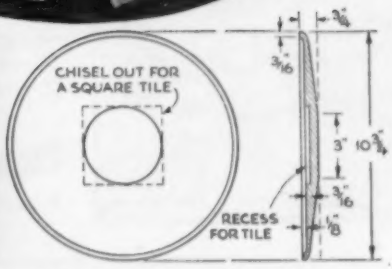
A REFLEX camera will help you learn to make perspective drawings. Set the camera on a tripod, pointing at the subject. Glance at the ground-glass image when you need help in getting the right perspective.—*Chuck Anderson, Burlingame, Calif.*

FOR HORS D'OEUVRES wooden platters are decorative on a buffet table. The tile center of this turned plate holds cheese or other tidbits served with crackers. It makes a fine cutting surface for the cheese.

CHECK THE TILE against the recess while the plate is still in the lathe. Apply wood filler, sand smooth, and give the piece a French polish. The center may be left natural.







Turned Plate Has Tile Centerpiece for Serving Snacks

GLUED to a waste-wood faceplate of sufficient depth to allow free use of the cutting tool on the underside, this wood-and-tile serving plate can be turned in one mounting in the lathe. Center the waste carefully on the turning blank. It should fit within the 3" diameter of the bottom. Glue heavy paper between the two pieces to make final separation easy, and allow the glue to dry thoroughly before screwing to the lathe faceplate.

If you are hesitant about the rigidity of the glued-up pieces, countersink three screws through the waste wood into the bottom. Be sure they are long enough to hold the turning blank firmly but not so long that the cutting tool will strike them when you are turning the recess.

Turn the face first, completing the rim and working to the recess. Then turn the underside. Gumwood (used for the plate shown), birch, maple and walnut are all ornamental and easy to work.—*Elma Waltner, Hurley, S. D.*

Snap-Lid Jars Made Re-Usable

BABY-FOOD and other glass jars having snap-on lids make handy containers for refrigerator leftovers or, in the workshop, for small parts. You can readily identify their contents without using labels.

To make the top easier to remove by hand and yet fit back on tightly, cut out and discard about one-third of the rubber-gasket fitting in the inside edge of the cap. A little experimentation will give you the right amount of friction needed.—*Allen W. Osterling, Dixon, Ill.*

Tubing Removes Pilot Lamps

HARD-TO-GRASP pilot lamps recessed in radio or instrument panels can be easily removed and replaced by using a short piece of rubber tubing. You simply push the tubing over the tiny bulb and twist counterclockwise. Then fit a new bulb in the tubing and reverse the process.

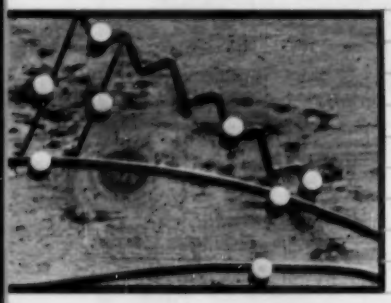
The inside diameter of the tubing should be a snug fit on the bulb so that it will not slip while being twisted.—*Mark Peters, Forest Hills, N.Y.*

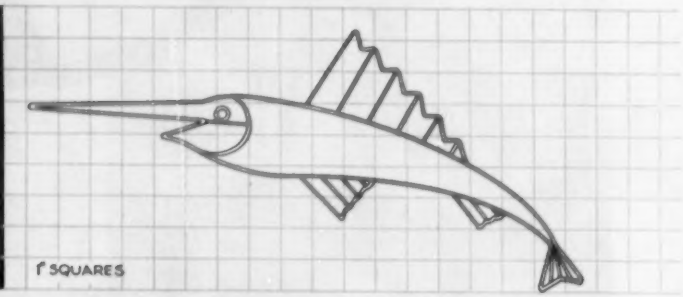
One-Evening Projects

Four Knickknacks for Your Walls

1 You catch these fish with bent coat hangers. Strip the finish off the wire with steel wool or sandpaper. Trace a full-size pattern on a grid of squares. Then shape the wire to match.

As the parts are formed, thumbtack them to a board as shown in photo below. Using acid flux, solder all joints. Solder a small washer in place as the eye. Finish in black.—*Clifton Morris, Lubbock, Tex.*



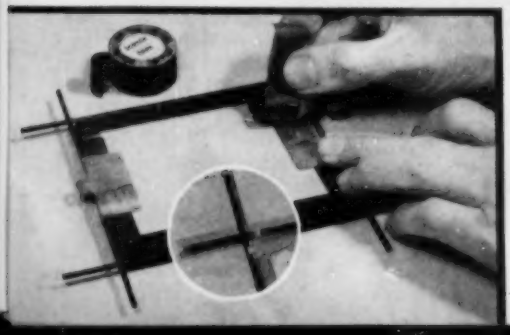


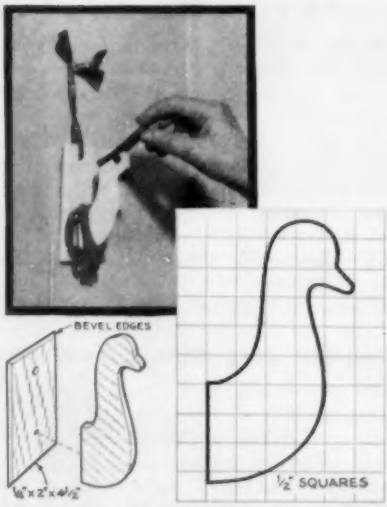
2 Matching the mode in wire accessories, this frame is made of coat-hanger stock. Cut photo, glass and cardboard backing the same size. Tape them together along the edges.

Cut four wires 2" longer than each side. File half-depth notches spaced so that the wires fit around the picture, corners lapped log-cabin fashion. Solder the joints.

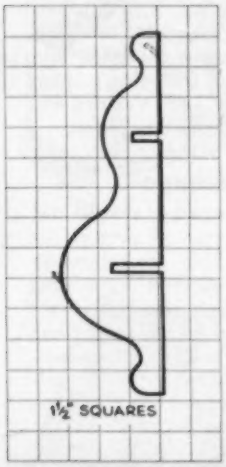
Solder pieces of tin-can stock to the top and bottom wires, flush with the outside except for a hanging tab. Paint the wire frame.

Insert the photo from in front. Flip it over to fasten the picture to the tinplate pieces with strong tape placed across these as shown in the photograph below.





3 It's a snap to keep rubber bands handy without the messiness of having them loose. Cut the head and neck of this holder from ¾" hardwood. Attach with glue and one wood screw to a back of ¾" stock having a 5/16" hanger hole. Paint white or yellow, with the bill and eye red or black. —*Theodore K. Hastings, Los Angeles.*

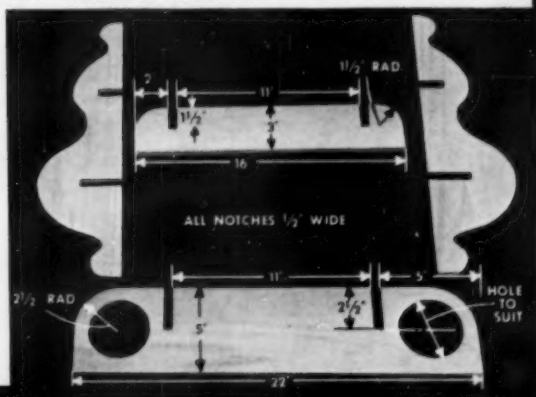


4 Twin ivy pots will add a touch of living greenery to this handsome Early American shelf. It consists simply of four pieces, notched to go together like egg-box partitions.

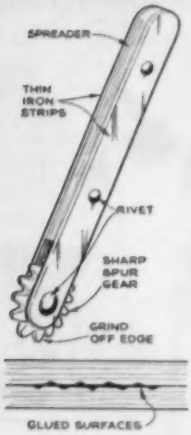
All stock is ½" thick. Solid wood is preferable to plywood, as the edges will show. If your jigsaw will cut 1" thickness, brad two pieces together and saw out both the sides at once. Make the notches a close fit for the thickness of the material.

Buy the planter pots beforehand so that the shelf holes can be cut to fit accurately. Sand all parts smooth and round the edges. Assemble with glue and brads driven at an angle through the rear shelf edges.

Stain, shellac and wax make a pleasing finish. Attach commercial hangers or drill blind ⅜" holes at the top corners as in the drawing. These slip over finishing nails driven at an angle into the wall.—*John G. Voelker, Towson, Md.*



Indentations with Homemade Tool Strengthen Glued Joint



INDENTING wood surfaces to be glued will give the joints extra strength. This can be done quickly and easily with a spur-gear wheel attached to a simple handle, as shown. When rolled over the surfaces to be joined, the spurs form tiny pockets which pick up the surplus glue when pressure is applied, equalizing the distribution and increasing the glued area. The handle can be made of thin iron strips riveted to a spreader slightly thicker than the spur gear.—*J. M. Finn, Pittstown, N. J.*

Water in Emergency

WHEN a neighbor's main-to-meter water line sprang a leak at the beginning of a plumberless holiday weekend, we contrived a means of giving him water without the necessity of lugging buckets from house to house. Shutting off the water at the curb and house cutoffs, we connected our two garden hydrants with a length of garden hose and an extra female fitting. Opening both valves provided his household with water.—*Wyeth Kidwell, Willoughby, Ohio.*

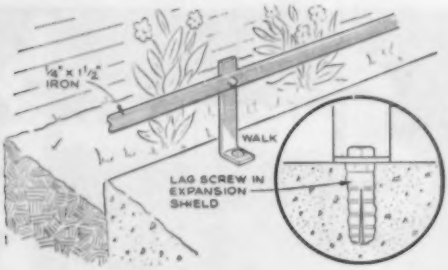
You Can Shake Out the Tacks

AN EMPTY tooth-powder can makes a good container for tacks, brads or small screws. A small funnel can be used for putting the parts into the shaker-top opening.—*E. V. Reymer, Townsend, Mont.*

Low Guardrail Along Sidewalk Saves Plants from Damage

THAT narrow space between a walk and the side of the garage can be perfect for small plants, even when they are subject to the threat of children's bicycles, if you protect them with a simple guardrail.

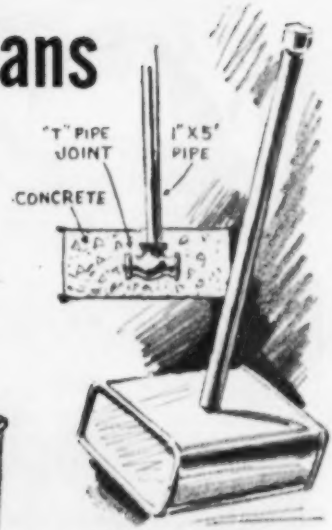
Bolt a length of ¼"-by-1½" iron to foot-long angles of the same material. Each upright is fastened to the concrete walk with a lag screw in an expansion shield set into a hole drilled with a star drill.—*Hi Sibley, Nuevo, Calif.*



9 USES FOR 1-Gallon Cans

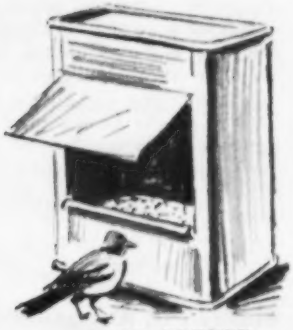
SCOOP FOR DRY MATERIALS

CHARCOAL STOVE



LAWN TAMPER

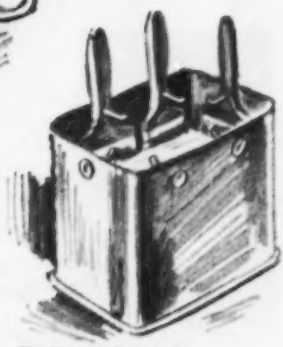
PLANTER



BIRD FEEDER

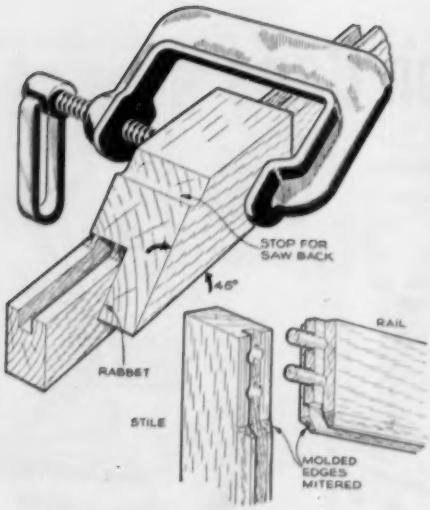
BUNSEN BURNER SHIELD

NAIL BIN



PAINTBRUSH-CLEANING TANK

DUSTPAN



Guide Block Takes the Guesswork Out of Making Door Joints

HERE'S an easy way to join a door upright, or stile, to a crosspiece, or rail, when the stock has molded edges.

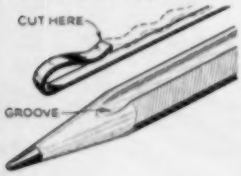
Rabbet a section of three-by-four so the resulting L-shaped block can be slipped over the stile as shown in the drawing. Then miter one end of the block at a 45° angle. Lay the front end of your backsaw against the sloping face of the block with the teeth at just the right depth to reach the base of the molding. Mark off the point where the thickened back of the saw will be when the cut is made and cut a slot above it to act as a depth stop. Now clamp the block in place and saw down through the molding, holding the flat of the blade against the sloping face of the block. Saw along the base of the molding to remove the unwanted molding.

The same block is used to miter the rail. This time, clamp it in place and cut off the projecting triangles of molding by sliding the back of a wide butt chisel along the face of the block.

After the molding cuts are made, the stile and rail can be brought to a butt joint and secured with dowels and glue.—*Edwin M. Love, Palmdale, Calif.*

Bobby Pin Keeps Pencil on Line

TAPED to a pencil, a bobby pin will keep the point from jumping the cord when you scribe along a chalk line. Cut the wavy leg of the pin short as shown. Cut a shallow groove in the pencil with a penknife, and bind the straight leg of the pin to your pencil with a piece of cellophane tape.



Mixer Is Knitting Aid

WHEN an extra pair of hands is not available, the electric mixer will prove an efficient and quick aid to winding knitting yarn. Tie an end of the yarn loosely to one of the blade shafts, run the mixer at its lowest speed, and guide the yarn to form a neat ball. Simply remove the beater from the holder and slip the ball of yarn off the shaft when the job is completed.—*Hannah L. Miller, Danboro, Pa.*

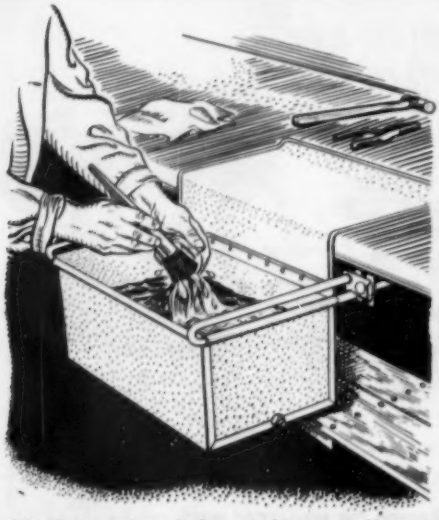
Tonic Keeps Nuts from Locking

RESEARCH engineers at General Electric have found that milk of magnesia keeps nut and bolt threads from locking together even after three weeks of heat high enough to melt a brass doorknob. They prescribe it as the best tonic for furnace nuts and bolts.

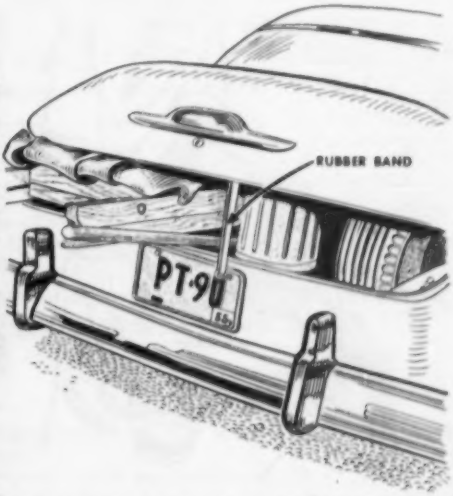
Hints FROM THE MODEL GARAGE

When a key breaks off in a car lock, try this trick. Smear the broken end with adhesive available from hardware stores for mounting sanding disks. Push the smeared end into the lock, then withdraw it. The adhesive may bring the tip out with it.

A trouble light usually has a hook only at the top, making it difficult to hang so that the light shines down. Solder a second hook to the back of the reflector, as above, and you will find that the light will be much more convenient to use.



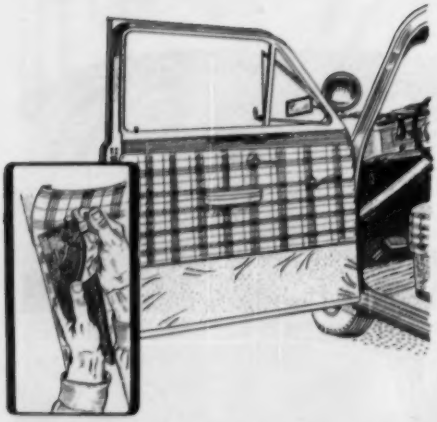
Storing solvent for washing small parts and tools in a service garage is easy this way. A fabric cover keeps dirt out of the metal tank and you can shove the tank back under the workbench when not in use. The slide is made of ½″ rod.



If your trunk won't close because you're hauling too much in it, here is one way you can secure the lid. Cut a rubber band from an inner tube, fasten one end under the lid and the other to an eyebolt locked with nuts to the license plate.

Please turn the page for more auto hints

MORE Hints from the Model Garage



Discarded seat covers can be used to hide soiled or torn upholstery on car doors. Turn the covers with the bottom side out. Cut pieces with an inch to spare on all sides. Turn the edges under. Remove the door panel and staple the cover to it.

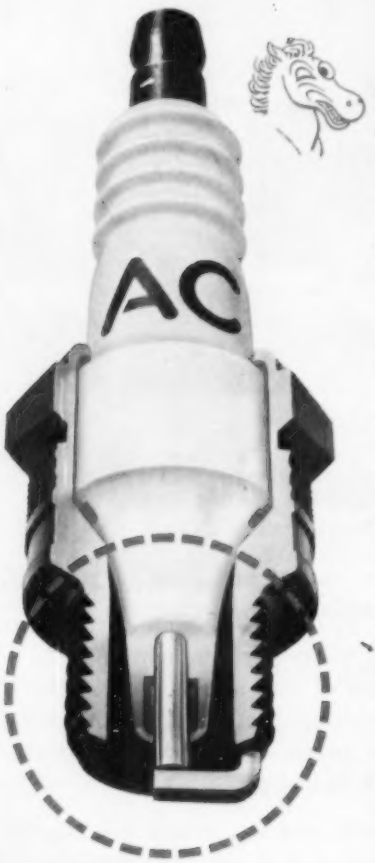
To keep on a driveway hidden by snow, line it with cement markers. Grease the inside of a glass jar, pour in cement and insert the bent end of a 3′ piece of heavy wire. Remove the jar when the cement has set. Next fall, raise the markers a foot or so.

Pouring gasoline into the tank inlet of a modern car without splashing the finish is always difficult, even with a funnel. A piece of radiator hose clamped to the screw-top opening of a gasoline can will serve as a flexible pouring spout.

Ramps for undercar work can be made by cutting eight 11½″ lengths of two-by-six stock. Nail these on edge to make box forms. Nail each box under the end of a 36″ length of two-by-twelve plank. Put the ends under the wheels and drive up on the ramps.

AC HOT TIP

-greatest spark plug achievement in high-compression history!



Ten years ago, AC increased "Scavenging" action as one step in meeting high-compression demands!

Engineers depend on scavenging action, as they term the high-velocity swirling of combustion chamber gases, to carry away the combustion left-overs that cause plug fouling. Years ago, 1944 in fact, AC Spark Plug engineers put this principle to work by increasing clearance between the plug shell and the insulator tip in the AC Type 48 plug. This extra "Scavenge" area alone did not satisfy AC.

An amazing thin-tip, fast-heating insulator added even more—and is still an AC exclusive!

AC developed the insulator material that has completely outmoded porcelain. And AC soon found a way to form this material into long, thin insulator tips that could be recessed around the center wire. These thin tips heat fast, burn away harmful combustion deposits, stay clean longer. No one else has yet been able to duplicate this design.

Proved by millions of miles of driving in every make of high-compression engine built in America!

Of course everyone expects AC to be in the forefront of research to improve ignition for high-compression engines. The important thing to remember is that these benefits of AC Spark Plug design have been available since the first high-compression engine came off a production line. *Today's AC Hot Tip Spark Plugs fit every American make of car!* They are the *only* plugs designed with double cleaning action. No other spark plugs offer anything like AC's thin, hot tip features.

AC Spark Plug engineers with GM resources can be depended upon to LEAD the ignition parade!

AC SPARK PLUG DIVISION GENERAL MOTORS CORPORATION

Watch BIG TOWN on NBC-TV

-another AC feature story that can't be topped!

You can make your own pictures right in the kitchen

No need for a special home darkroom

Modern photo developing and printing equipment is simple, easy-to-use, modest in price.

There's plenty of enjoyment in taking pictures but, if you're looking for a real thrill, try developing and printing them yourself.

It's fascinating to watch the scenes you've taken "come to life" . . . to see familiar sights suddenly reappear as if by magic. Added to this is the pleasure your family and friends will get from those extra prints you make for them.

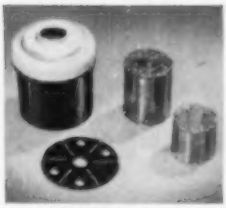
Of course your photo dealer is always ready to have your film processed for you, but if you want to enjoy this fun and fascination of doing it yourself, don't hesitate any longer.

With today's equipment there's a minimum of fuss and bother to home photo-making. Most of the steps can be done in room light and your set-up need not be elaborate.

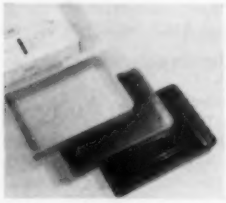
Above is an arrangement suitable for your kitchen. And, on the opposite page, the equipment shows how simple it all is—step by step.

Your local photo dealer has illustrated booklets to get you started on this rewarding family hobby. See him soon, won't you?

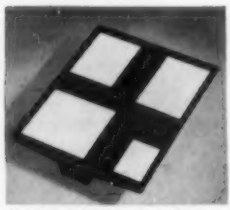
THIS INEXPENSIVE LINEUP LETS YOU START RIGHT NOW



Kodacraft Roll-Film Tank with aprons for easy developing of 620-120, 127 films. $2.53.



Kodacraft Rocker Tray Set includes three 5" x 7" trays, with rocker for uniform developing. $1.95.



Kodacraft Printing Frame with masks for 9 negative sizes. Accepts 4¼" x 5½" paper. $1.95.

You can *develop* that roll of film at home *tonight* . . .

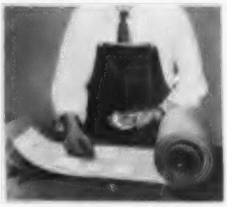
The most convenient developing procedure is to use a small tank, such as Kodacraft Roll Film Tank. Handy Kodak Tri-Chem Pack contains developer, stop bath and fixer chemicals. You just mix with water. Put developer solution in tank. Step into any darkened closet to load the film in the tank. The rest of the operation is carried on in ordinary room light. Agitate film in developer, then in stop bath, and finally in the fixer. Remove film from tank, wash in sink, and dry overnight. Your photo dealer has detailed, easy-to-follow instructions. It's so simple even a child can learn in no time.

. . . *print* the pictures *tomorrow* (Kodak Velite Paper lets you do this in subdued room light.)

Simply place negative in Kodacraft Printing Frame; lay sheet of Velite Paper on negative; close printing frame; expose to ordinary lamp bulb for few seconds. Place exposed paper in tray of developer solution; in about a minute you'll have your picture appearing. Developed print is then placed in stop bath and next the fixer. Wash print and dry on blotter.

Kodak Tri-Chem Pack contains enough chemicals for processing two complete rolls of film. $.25.

Kodak Velite Paper makes prints in lighted room. 25 sheets, 2½" x 3½" and larger. From $.38.



Kodak Blotter Roll for efficient print drying. Capacity—60 average-size prints. $2.88.

CONVENIENT PHOTO DEVELOPING AND PRINTING SETS AVAILABLE

Should you desire, your photo dealer can provide you with complete developing and printing equipment in handy kit form.

Kodacraft Advanced Photo-Lab (right) contains Kodacraft Metal Printer, Kodacraft Roll-Film Tank, Kodacraft Rocker Trays, Kodak Velite Paper, darkroom lamp, graduate, thermometer, film clips, stirring rod and instructions. $14.95.

Kodacraft Photo-Lab Outfit (left) includes all items of Advanced Photo-Lab except offers Kodacraft Printing Frame (with mask set) instead of Metal Printer and is without lamp and stirring rod. $9.75.

Prices subject to change without notice

Eastman Kodak Company, Rochester 4, N. Y.

Kodak
TRADE-MARK

Gus Encounters a Stubborn Miss

[Continued from page 182]

"I wouldn't say that exactly," Vancourt put in. "After all, let's not give up so easily. Elmer, we must advance to the rescue of our pal. Now let me see. How can we help him?"

"Help me!" Gus roared. "Why, you slinking coyotes, I'll bet that you two are at the bottom of this."

"Listen to the ungrateful cuss," Stoddard sorrowed.

"The thing to do," Pete Vancourt said, winking at Stan Hicks, "is to figure out the lady's next move. Then we can short-circuit it."

"If you two open your traps again," Gus growled, advancing with poised screwdriver, "I'll ram this right down—"

"I've got it," Pete Vancourt exploded, snapping his fingers. "The next time Emma's car breaks down, she'll arrange to have it happen way out on some lonely road, at night."

"How cozy," Stoddard cooed.

"Get out!" Gus bellowed as the pair went down the street grinning.

Gus Receives a Night Call

When Emma Wilks actually did call Gus from a lonely country road the next evening at dusk, Gus hung up the phone feeling as if he had been poked in the stomach with the handle of a screwdriver. He tossed his kit in the service car and drove out without telling Stan Hicks where he was going.

Gus's lights picked up Emma's car at the bottom of a steep grade five miles out in the country. She greeted him happily.

"I *knew* that everything would be all right when I got you on the phone," she said. "I called from the farmhouse over there, and here you are. How nice."

"Yeah," Gus said hollowly. Without hesitation he raised the hood and took off the valve cover. Seeing the keeper half of number four on the cylinder head in the light of his flash nevertheless jolted him. This would be the third time he'd put this keeper in. First thing he'd know, the other half would fly out, and there'd be a valve through a piston. Gus had the uncomfortable feeling that Pete Vancourt and Elmer Stoddard would leap from the brush at any moment.

Thinking about them as he replaced the keeper, it came to Gus that he might have let their kidding warp his usual calm judgment. With the keeper once more in place, he installed the curved disk of the oil cap on the top of the valve stem, and peered closely at the valve, using his flash. He grunted, brought a feeler gauge from his pocket, attempted to thrust it between the rim of the oil cap and the top of the spring.

Oil Cap Gets a Pounding

"Miss Wilks," he said disgustedly, "you have been bringing your car to a fool."

"Why, Mr. Wilson!"

Gus didn't hear her. He was busy taking off the oil cap, placing it on the flat of a fender dolly, pounding its rim with a hammer, replacing it, adjusting valve rocker-arm clearance and sending Emma on her way.

Back at the Model Garage a shamefaced Gus told Stan Hicks the sad story.

"When they ground the valves," he exclaimed, "they naturally trued up the ends of the stems on a grinder. But they ground number-four intake a little short, so that the oil cap, instead of resting on the top of the valve stem, rested its rim on top of the spring.

"So when the rocker arm came down to open the valve, the curved-down rim of the oil cap brought pressure to bear on the spring before pressure was brought to bear on the valve stem. This released pressure on the keepers, allowing one half to pop out. With the spring cocked over, the other half fortunately stayed in. All I had to do was to flatten the rim of the oil cap, so it would rest again on the valve-stem top and clear the spring."

Stan Hicks grinned disbelievingly. As he moved off to close up for the night, he hummed the *Wedding March.* END

NEXT MONTH: Gus pulls a switch.

How Researchers Solved

Detroit's Biggest Problem

...their ingenuity may make your present engine last years longer and save you hundreds of dollars in repairs.

THEORETICALLY, YOUR ENGINE should never wear out, because the moving parts never touch each other. They're always separated by a thin film of oil. The problem is to keep abrasive particles out of that thin film of oil. That problem has become tougher every year since the Model T, as engine clearances have become finer and speeds higher.

Today, abrasive particles comparable to the thickness of the ink on this page may do hundreds of dollars of damage to your engine!

Because hot oil, under pressure, often forces "channels" in rag or paper filter packs, these abrasives get through. That's why a team of researchers developed a new material for oil filters: porous bronze.

This new filter material is made of millions of microscopic balls fused together. No amount of oil can force a channel in it. No dangerous abrasive particles can get through. It doesn't soak up valuable oil additives as absorbent filters do. *And you never change it!* You simply rinse it in gasoline and keep on using it for 10,000, 100,000 and more miles of driving. It's called the Life-Time filter.

The cost? About the same as a couple of throwaway filter packs. In addition to saving the cost of filter pack replacement, you save the quart of oil soaked up and thrown away with ordinary filter packs and – most important – you save money on engine repairs by filtering out dangerous abrasives.

Evolution of Bronze Filter Design

1. "Tin Can" **2. Rigid Cone**

1. First crude attempts to design a bronze filter simply imitated the shape of the ordinary throwaway pack. Because of its basic structural weakness and the danger that sediment packing between the element and the case might critically reduce oil pressure, all attempts to "improve" this design were abandoned, even though it was relatively cheap to manufacture.

2. After considering almost every geometric shape, the cone was selected as the most rigid and was used for the Life-Time filter. This design also allows the sediment to drop to the bottom of the case, clear of the element. It has withstood the ultra-sonic vibration test and the 100G shock test. Only the Life-Time filter uses this exclusive cone design; it is fully protected by patents.

HOW TO GET A LIFETIME FILTER FOR YOUR CAR

Try the Lifetime filter on your car for 2 weeks: if it isn't all I say, you get your money back; if you keep it, you're through buying filter packs—the Lifetime filter is guaranteed for 10 years, actually will last many times that long.

For complete unit, including case (install on any car in 10 minutes), send make, year and model of your car and $12.95 (we pay shipping).

Conversion kit, which replaces your present filter pack with Life-Time bronze, is $6.95 for most cars (send make and number of present filter when ordering). Conversion kits for Buicks with hydraulic lifters and for cars with full flow systems: $13.95.

Or send only $2 deposit, pay C.O.D. charges on arrival. But do it today—don't waste another cent on filter pack replacements!

Complete Lifetime Filter; fits any car.

Lifetime Conversion Kit; replaces ordinary packs with permanent bronze element.

OPPORTUNITY FOR DEALERS AND DISTRIBUTORS

A dealer and distributor network is now being formed to handle demand generated by advertising and editorial features in national magazines. If you can qualify, you can be first with the most exciting automotive product of this decade, to win new customers and build a substantial business. These valued franchises are not being sold; they are awarded on the basis of ability to grow with us. For complete details, write or wire: Continental Manufacturing Corporation, Dept. FPS-2. Washington Blvd. & Motor Avenue, Culver City, Calif.

Permanent Filter Division, Dept. FPS-2
CONTINENTAL MANUFACTURING CORP.
Washington Blvd. at Motor Ave., Culver City, Calif.

Ship ☐ complete unit for _____
make, model, year of car

☐ conversion kit for _____
make and number of present filter

I enclose ☐ $12.95 for complete unit ($18.95—chrome)
☐ $6.95 for conversion kit (full-flow, $13.95)
☐ $2.00 deposit; send C.O.D.

Name _____

Address _____

City _____ Zone _____ State _____

The FACTS behind Ford's new Trigger-Torque Power

The world's greatest builder of V-8's brings you all the advantages of high-torque "Go" in 3 new and mighty engines for 1955!

FOR YOUR CAR to do all the things you want it to do—*and do them well*—it must have the ability to deliver just the right amount of "push" at the rear wheels when you need it. That "push," of course, is the direct result of engine *torque*. And Ford's new engines are capable of delivering much higher torque throughout the full range of driving speeds. The result is new Trigger-Torque power with trigger-quick response available to you in any traffic situation. On the highway, too, you'll pass with the confidence that you've got power to spare.

Ford's many new engine advances make this Trigger-Torque power possible. For example, *all* '55 Ford engines have higher compression ratios which mean greater efficiency. There are new free-flow induction systems for full breathing and even distribution of fuel. There are brand-new, deposit-resistant turbo-action spark plugs . . . and improved turbo-wedge combustion chambers for more efficient mixing and burning of the fuel-air charge.

In addition, there's Ford's traditional rigid deep-block construction for longer life and smoother operation. There's Ford's famous low-friction design for less wear and more economical use of gas. And *every* Ford engine features the exclusive power-boosting, fuel-saving Automatic Power Pilot.

NEW 162-h.p. Y-BLOCK V-8

If you haven't driven Ford's new, more powerful Y-block V-8 yet, you're in for some thrilling surprises. For this engine, with its greater displacement (the highest in Ford's field) and higher compression, is another engineering triumph from the world's leading builder of V-8's. In all Fairlane and Station Wagon models, this new engine has a dual exhaust system that reduces back pressure . . . releases more usable power to the rear wheels.

NEW 182-h.p. Y-BLOCK SPECIAL V-8

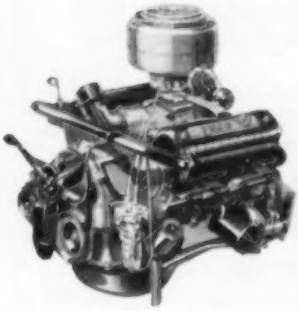
If you want even greater Trigger-Torque performance you can have Ford's Y-block Special V-8. It's available on all Fordomatic-equipped Fairlane and Station Wagon models. The compression ratio is 8.5 to 1. And the 4-barrel carburetor *really* opens up when you need GO. An "extra" pair of barrels boosts the flow of fuel-air mixture as needed to meet acceleration demands . . . cuts out automatically when a steady speed is resumed.

NEW I-BLOCK SIX

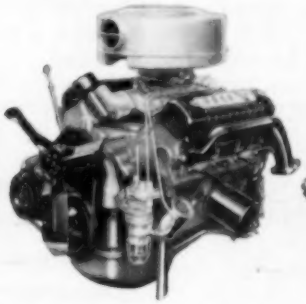
If you prefer sixes, Ford's new I-block Six is America's most modern. It's the only short-stroke, low-friction six in the industry today. And with its higher compression ratio and its improved carburetion system you get higher torque at all driving speeds.

WHY NOT MAKE YOUR OWN TEST DRIVE, THIS WEEK

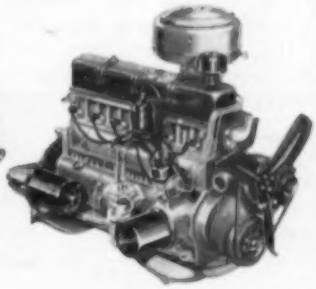
3 MIGHTY ENGINES FOR 1955



162-h.p. Y-block V-8
272 cu. in. displacement,
7.6 to 1 compression ratio.

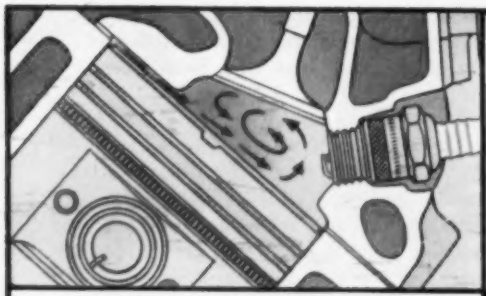


182-h.p. Y-block Special V-8
272 cu. in. displacement,
8.5 to 1 compression ratio.

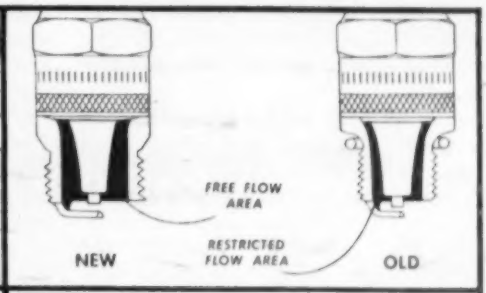


120-h.p. I-block Six
223 cu. in. displacement,
7.5 to 1 compression ratio.

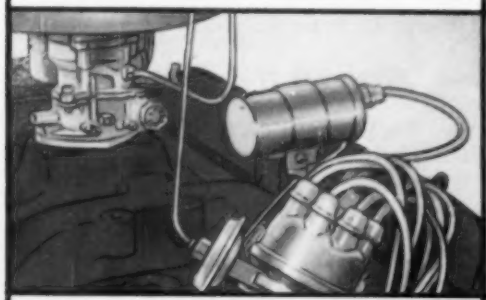
All 3 new Ford engines have these important advances



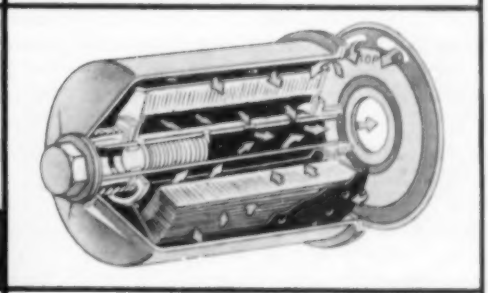
Turbo-Wedge Combustion Chambers are wedge-shaped to swirl fuel and air into a uniform mixture for efficient combustion.



New Turbo-Action Spark Plugs (a Ford "first") resist formation of deposits up to three times as long as conventional plugs.



Automatic Power Pilot makes sure just the right fuel-air mixture is ignited at just the right instant to give you more "GO"!



Full-Flow Oil Filter, available on *all* Ford engines, cleans *all* the oil *all* the time . . . protects bearing surfaces from harmful abrasives.

Big Business Grown from Strawberry Patch

[*Continued from page 151*]

Co. of Cleveland, and became a powdered-metal specialist, working on parts for aircraft disk brakes, superchargers and other war projects.

By 1947 the job was over, and he said to Floyd Kuhen, an old friend from his Nela Park days, "Floyd, I'm going to do it now." There was no question about what he meant. He had dusted off the power hoe.

"Howard had wonderful support from his wife," Kuhen relates. "Maybe she didn't have his faith in the machine, but she had plenty in him."

A Little Cash and a Lot of Confidence

Few others offered him any solid encouragement. Ober's father still thought he should become a dairy farmer. But, with the help of Kuhen and some local implement dealers, Ober put his hoe on the market. Capital was scarce, but his distributors showed their faith in him by advancing cash so that he could buy raw materials.

Kuhen quit his job to devote his full time to selling Ober's hoes. During the fall and winter, when nobody would consider buying garden tools, Kuhen worked alongside Ober in the shop, welding, drilling and assembling machines for what they hoped would be a spring rush of business.

"You couldn't tell which of us was the boss," Kuhen relates, "except that Howard often worked long after I went home."

Sales in 1948 rose to $22,900. Ober sold no stock, obtained no financing. He plowed the receipts back into the firm as fast as they came in. That winter Kuhen went to Florida to sell hoes there during the slack season in Ohio. He not only called on dealers, but stopped his car whenever he saw a man working in a garden, hauled out a Roto-Hoe, and demonstrated it on the spot.

Not content with making a tiller-cultivator, Ober meanwhile designed a number of attachments that would convert the basic machine into a sprayer, lawn mower, edger and rotary snowplow. Suburbanites became increasingly aware of this aid to aching muscles. The plant was enlarged, a streamlined office organization set up.

The Roto-Hoe and Sprayer Co. now employs about 50 shopworkers in peak periods, and has an office and administrative staff of 25. It's at least 50 times as big a business as it was when Ober started it only seven years ago.

Machines Handle the Correspondence

That Ober still loves gadgets is suggested by the number of machines used in his office. Accounts are calculated and invoices made out by automatic machines. Routine letters type themselves after an employee has written the name, address and date—a perforated tape like that in a player piano triggers the typewriter keys to rattle off the rest. All office stationery, ink and typewriter ribbons are bright green, like the Roto-Hoes themselves.

The company's newest model, the Hummin' Bird, is entirely Ober's own design. It has the same 2-hp. engine as his standard model, but the tines revolve in a horizontal plane at the back instead of in roller fashion at the front, letting the machine work in closer quarters.

Mrs. Ober doesn't consider her husband much of a home handy man. Though he cuts the grass, using a Roto-Hoe with the mowing attachment, he hasn't found time for a garden of his own.

"Think I'd better start one, though," he says. "We've been running an ad that says gardening is great relaxation. That sounds like just what I want." END

Progressive Thinking

A first-grade class at the museum was deeply interested in the mummies.

"What does that label—B.C. 789—mean?" little Sue asked her small boy friend.

"Oh, that's the license number of the car that hit him," he replied with masculine assurance.—*Public Safety.*

Texaco Tips On Car Care

How to keep from getting stuck in ice and snow→

To avoid getting stuck in ice and snow, keep a container filled with a mixture of sand and ordinary rock salt in your car trunk. Then, if your rear wheels begin to spin, sprinkle a handful of the mixture directly in front of each rear wheel. It is also good to let a little air out of the rear tires for more traction. Shift into second gear (or "Drive" with automatic transmissions) and give it only a moderate amount of gas—*do not* race the engine. Doing this, you should move out of any impeding snow or ice. For best mileage — both tires and gasoline —don't forget to reinflate your tires promptly.

←How to get the best all-'round performance from your engine

Rugged road tests—millions of miles of both low-temperature mountainous driving and hot desert high-speed runs in more than a hundred new cars—were conducted recently by an independent research organization. The purpose was to find the best motor oil for today's high-compression engines. Results: Test engines using Havoline (1) had greater gasoline and oil economy, (2) showed no appreciable wear, (3) and were much cleaner. Havoline will give you all-'round performance that no other motor oil can deliver . . . regardless of price. For more engine power, greater gasoline mileage and new-car liveliness that *lasts*, get Havoline today.

See your Texaco Dealer . . . *the best friend your car has ever had.*

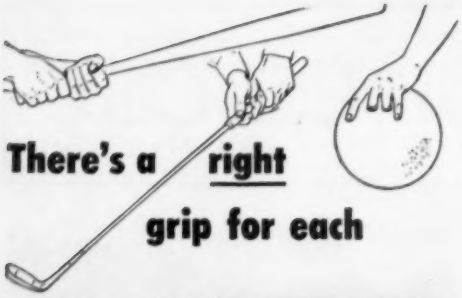
TEXACO

TEXACO DEALERS IN ALL 48 STATES

Texaco Products are also distributed in Canada and in Latin America

THE TEXAS COMPANY

TUNE IN: TEXACO STAR THEATER starring JIMMY DURANTE or DONALD O'CONNOR, on TV Saturday nights. Metropolitan Opera radio broadcasts every Saturday afternoon. See newspaper for time and station.



There's a right grip for each

IN FACT, there's usually a right grip for each situation you face and each result you want to achieve. In filing both the right type of file and the right grip, stroke or touch are necessary—(a) for the kind of metal you are filing; (b) for the roughing, finishing, smoothing or sharpening the job calls for.

Nicholson's famous 52-page book, *"File Filosophy"* (in a new edition just off the press), is rich in information on the subject. It also illustrates and describes a comprehensive assortment of Regular, Special Purpose, Curved Tooth, Swiss Pattern and Rotary files every skilled homecrafter or professional mechanic will be proud to own. The book is FREE—*send for it.*

Nicholson and Black Diamond file brands have no superior anywhere in the world. Good hardware stores pride themselves in selling them.

NICHOLSON U.S.A.

NICHOLSON FILE COMPANY
19 Acorn St., Providence 1, R. I.
(In Canada: Nicholson File Company of Canada Ltd., Port Hope, Ontario)

NICHOLSON FILES *FOR EVERY PURPOSE*

How to Win Fame and $1,000

[*Continued from page 144*]

The original device had another serious weakness. Because magnetization had taken place at only one point on the wire's circumference and because the wire tended to rotate as it was played back, the sound would fade out and then come in again. Camras took care of this by extending the magnetic field all around the wire.

To fight the depression, Marvin's father had dropped bookbinding and gone into the grocery business. In a room over his store the boys put their apparatus together. It was a bulky thing, spread over several tables. But one evening, after working nights and weekends for a month, Camras turned a switch, watched the piano wire roll off one spool onto the other, and whistled a few notes of *Yankee Doodle*. Then he rewound the spools and started them forward again. *Yankee Doodle* came whistling back at him.

Recorder Wins Him a Job

When the Institute opened for the fall term, Camras carted his device to the electrical-engineering lab. The professors suggested that he demonstrate it to the Armour Research Foundation. He did so and was promptly invited to go to work for Armour as soon as he finished school. This he did in June, 1940, completing the four-year electrical engineering course in 3½ years and graduating at the top of his class.

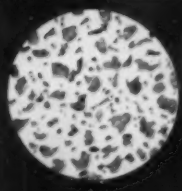
Armour Research Foundation, which specializes in work for industry but has a number of important Government contracts, now employs more than 1,100 scientists and engineers. Half a dozen of these work with Camras, who is rated as a senior physicist. In the summer of 1940, however, the staff numbered about 25; the electrical engineering department had two men, counting the new graduate; and Camras could spend only part time on his device. To keep improving it he worked nights, often until four a.m.

Early in World War II, some Naval

[*Continued on page 252*]

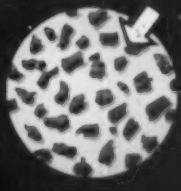
ALL ABOUT TOBACCO... INCLUDING SEVERAL REASONS WHY

Edgeworth Never Bites Your Tongue



Some brands give you shorts and bits which burn like tinder—fast and hot.

Others give you fine-cut shreds—good for cigarettes, but not so good for pipes.



Only Edgeworth gives you slow-burning "chunks" made for pipes and pipes alone.

Edgeworth's Way with White Burley Has Never Been Equalled

Tobacco experts know white burleys are the world's coolest smoking tobaccos. Edgeworth is a blend of aged burleys only. Other tobaccos use white burley too—but nobody yet has found how to process tobacco to give it the even-burning, cool-smoking character of Edgeworth "Ready-Rubbed".

What "Ready-Rubbed" Means to Your Smoking Pleasure

Old-Timers knew the secret of cool, even burning. They "hand-rubbed" their tobacco until it crumbled into chunks of just the right size. Now before Edgeworth is packed, an exclusive process "ready-rubs" it to give you a cool smoke with never a touch of tongue bite.

This Amazing Pouch Means Cooler Smoking!

Edgeworth leaves our plant with just the right moisture content for a cool, no-bite smoke. Every pouch is that way when you open it, for only Edgeworth has the Seal-Pak pouch. Air-and-water tight, it promises you fresher tobacco than any other pocket pack.

Forgotten in Tackle Box—Edgeworth Still Fresh

A fisherman left an unopened Edgeworth pouch in his tackle box for a year. When found, the tobacco was still moist and cool smoking.

FOR A COOL MIXTURE TRY HOLIDAY

A blend of five tobaccos selected for mildness and aroma—in the Seal-Pak pouch.

SPECIAL OFFER $1.50

Get this new polished aluminum stem "Park Lane" pipe with interchangeable imported briar bowl and exclusive *"dri-dome"* moisture trap—along with 2 full-sized pouches of EDGEWORTH tobacco. If your dealer cannot supply you, use this handy order blank.

Name _____

Address _____

City _____ State _____

Mail with $1.50 to Park Lane, Larus & Brother Company, Inc., Richmond, Virginia.

PS 2

YOU'RE SMARTER SMOKING

Edgeworth

AMERICA'S FINEST PIPE TOBACCO FOR OVER HALF A CENTURY

MORE SANDING AREA

than any sander in its price class

LOWEST SANDER DESIGN

TERRIFIC POWER
with unequalled endurance
only $14.95 model 700

The Newest Power Sander and Polisher on the Market

As efficient as any rotating motor-driven sander, plus these quality features: straight-line action, no bucking, sands *with* the grain and goes all the way into corners; powerful 60 cycle reciprocating motor gives 14,400 strokes per minute; exclusive insulation gives smooth, quiet operation; push-button control; 8 foot cord.

Weller **SANDERS**
806 Packer Street
Easton, Pa.

AVAILABLE AT HARDWARE STORES

[*Continued from page 250*]

officers saw the recorder and quickly passed the word to the Pentagon. Before long a hand-built model had been installed in a submarine to pick up what happened during maneuvers. Officers then analyzed the record and suggested ways of improving undersea operations.

By the end of the war, more than 10,000 recorders had been delivered to the services by 48 manufacturers licensed to use Camras patents. Now more than 60 companies hold Armour licenses.

Though an exceedingly modest man, young Mr. Camras is not surprised by the immediate success of his work or by the constantly growing uses to which his inventions have been put. He thinks magnetic recording is wonderful. His only surprise is that someone else didn't develop it long ago.

Since the war, Mr. Camras has concentrated on tape, rather than wire, as a recording medium because of the ease with which it can be spliced and edited.

Most of the tape sold so far has been blank. The buyer has used it to make his own programs—recording his family, or the radio, or a party. But there is an increasing market for recorded tape because it has excellent fidelity, is easy to store, and can be played thousands of times.

Spike Jones for a Quarter?

The inventor suggests that music stores might offer a make-your-own recording service. The customer would load a spool of blank tape into a vending machine, drop a quarter in the slot, and come away with a Brahms or a Spike Jones.

Also on the Camras work program is a method for recording both the pictures and the sound of a TV program—so you could spend Saturday afternoon fishing and still catch the baseball game when you got back.

Since he collects a share of the royalties paid by patent licensees, the father of modern tape recording describes him-

[*Continued on page 254*]

"The Performance of Chevrolet's Three New Engines Is Only Half the Story"

—Ed Cole, Chevrolet Chief Engineer

Your shoulders and your ears will tell you about the *performance* of the new Chevrolet "Turbo-Fire V8" . . . for you'll feel the sky-rocket acceleration as 162 h.p. shoves you back into the seat . . . and you'll strain to hear the hush of eight balanced power impulses.

But I wish it were as easy to explain the even more important *design* features that give this ultra-compact power plant its long life and economical running—how, for example, we planned for low heat-rejection, so the cooling system could be smaller; how we cut the stroke to three inches to pare down power-wasting friction (and how this let us use a four-quart oil capacity instead of five); how the shorter, lighter connecting rods put less strain on the bearings; and how the high-turbulence cylinder head permitted the super-efficient 8 to 1 compression ratio.

I'd like to take you "inside" the two new "Blue-Flame" 6's to show you the high-capacity water pumps, the one-third reduction in fan speed (which means much quieter running), the floating intakes that pick up cleaner oil, the four-point engine suspensions that smother power vibrations, the 12-volt electrical systems that give faster winter starting and better firing at high speed —all the things that make these overhead-valve sixes the world's yardstick for engine dependability.

But I can't even list all the *major* engineering advances on this page. All I can say is: Once you've driven a 1955 Chevrolet you'll know why we're so proud of these three new engines. . . . Chevrolet Division of General Motors, Detroit 2, Michigan.

motoramic

CHEVROLET

More than a new car...a new CONCEPT of low-cost motoring!

To restore Full, Clean Power in Your Car do as the Fleets do . . . replace with Federal-Mogul Bearings

*The men who run America's great truck and bus fleets *know* how to recondition engines for best results. For example, a recent independent industry questionnaire, involving 83,360 trucks and buses, disclosed this fact: 66.7% of the vehicles surveyed get Federal-Mogul engine bearings as *first choice* for replacement. Do as the experts do! In reconditioning your car engine, install Federal-Mogul Oil-Control bearings. They restore full, clean power, pick-up and economy! They cost no more, yet have led the replacement field for 30 years . . . because of quality! Federal-Mogul Service, Division Federal-Mogul Corporation, Detroit 13, Michigan.

for New Power . . .

FEDERAL-MOGUL

Oil Control Bearings

BEARING MANUFACTURERS TO THE AUTOMOTIVE INDUSTRY SINCE 1899

How to Win Fame and $1,000

[Continued from page 252]

self as well off—for a physicist. Had he gone into business for himself, he might have made a fortune, but he prefers to work in what he calls a campus atmosphere, without thought of what his work may get him. When someone recently described his car as old, Camras remarked in surprise that he'd been driving it scarcely six years.

He'll Burn Midnight Oil in Sun House

The Camrases have been living in a three-room apartment but are building a ranch-type house in Glencoe, Ill., 25 miles from Chicago. If pressed, Marvin Camras will tell you that it's a solar house—meaning he has designed it so that the sun's rays can get in during the winter and help heat it. But his principal interest is in its basement. It will run the length of the house and be filled with lathes, saws, vacuum pumps—"no end of stuff."

"If you have some equipment at home," he explains, "you can work until four in the morning without having to worry about transportation."

Camras sometimes is asked how you go about being an inventor. He then paraphrases the advice of a famous composer. "If you have to ask how to become an inventor," he says, "you will never become one."

That sounds a little harsh, so he adds, "You have to take an interest in something, and you also have to have a lot of luck."

That is *his* account of how he has won fame and $1,000 from the earnings of $4,000 that a Scotchman gave to the City of Philadelphia in 1816. END

Point of View

Two motorists met on a bridge too narrow for two cars to pass.

"I never back up for an idiot," shouted one driver.

"That's all right," replied the other quietly, as he shifted into reverse, "I always do."—*Youngstown Kitchens Merchandiser.*

THERE IS NO LONGER ANY EXCUSE FOR NOISY OUTBOARD MOTORING

FOR 1955

FOUR "SUSPENSION DRIVE" SEA-HORSES!

Here are America's *deluxe* outboard motors—the quietest running, easiest driving, smoothest riding Sea-Horses ever developed! The *new* Sea-Horse 10, the *new* Sea-Horse 25 and the *new* Electric Starting 25 are floated from their stern brackets like the Sea-Horse 5½, which created a sensation with its smoothness and its quiet. *That's Suspension Drive!* It isolates your boat from engine vibration as no other method of mounting can. Engine throb is absorbed—noise is dissipated—and you experience the thrill of big motor speed with amazing new quiet and comfort . . . See your Johnson Dealer. Look for his name under "Outboard Motors" in your classified phone book.

FREE! New Sea-Horse Catalog. Describes the 5 great Sea-Horses for 1955, including the famous 3 hp. 32 lb. twin Sea-Horse 3. Write for your copy.

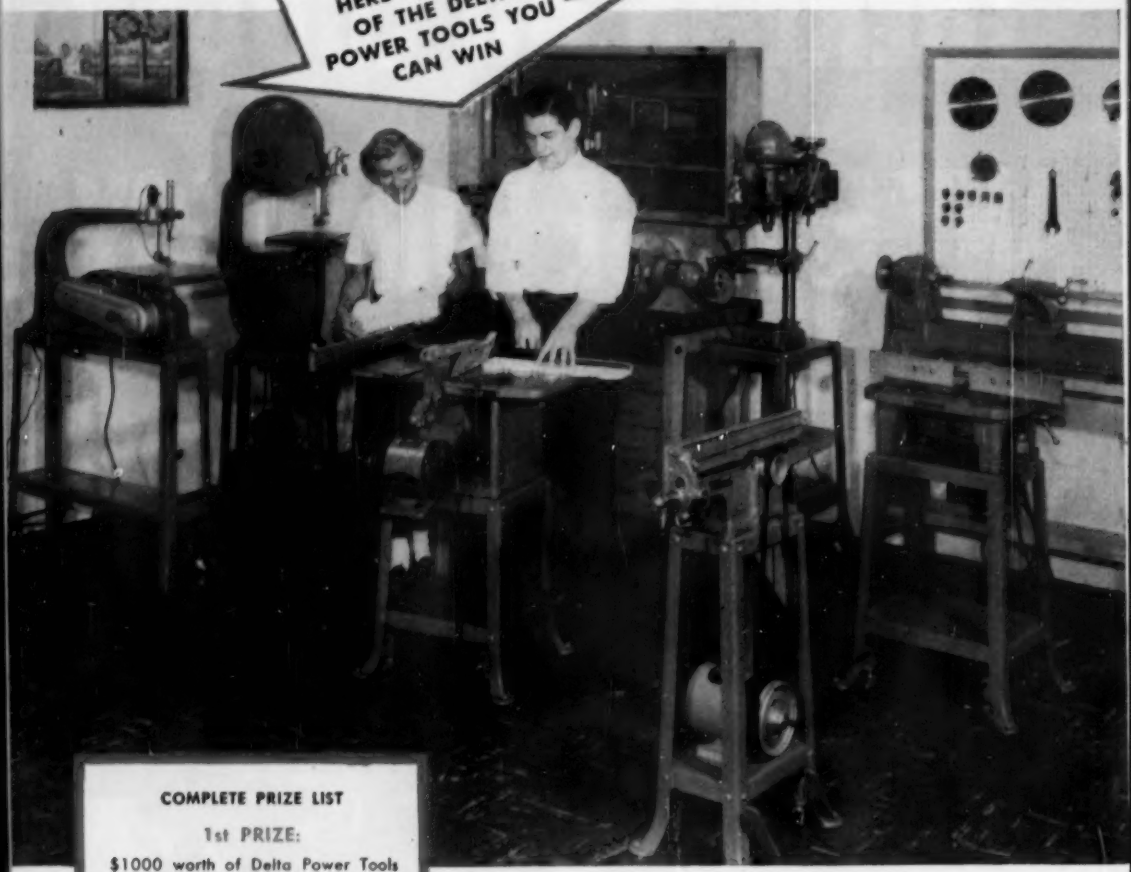
JOHNSON MOTORS, 500 Pershing Rd., Waukegan, Ill.
In Canada: Mfd. by Johnson Motors, Peterborough

Prices f.o.b. factory. Subject to change without notice.

Johnson
SEA-HORSES
FOR DEPENDABILITY

A DIVISION OF OUTBOARD MARINE & MANUFACTURING COMPANY

Win up to $1000 Worth of



COMPLETE PRIZE LIST

1st PRIZE:

$1000 worth of Delta Power Tools and accessories of your choice.

2nd PRIZE:

$750 worth of Delta Power Tools and accessories of your choice.

3rd PRIZE:

$500 worth of Delta Power Tools and accessories of your choice.

4th PRIZE:

$250 worth of Delta Power Tools and accessories of your choice.

PLUS: Ten honorable mention certificates, each worth $10 in Delta Power Tools or accessories.

Win the Delta Tools You've Always Wanted

. . . If you're now a Delta owner, no one needs to tell you about Delta quality. It's there in the rugged feel of your Delta machines, in the smooth way they operate, in the almost complete freedom from maintenance problems, and in the fine precision work they help you turn out more easily. And now you have a chance to get *more* Delta tools—absolutely *free*. What would you like next? A Delta Unisaw, the finest circular saw made for industry and the home? . . . A Band Saw? Scroll Saw? Grinder? Have you seen Delta's new 6" Jointer, with extra long bed? Or the brand new Delta 14" Drill Press with eleven exciting new features?

Whatever it is you want most, now's your chance to get it —*and more*. So, get your entry form for the big Delta Users' "FINEST HOME WORKSHOP" Contest, and get going *now!*

DELTA QUALITY MAKES THE DIFFERENCE

Fine DELTA Power Tools

in Delta Users' "Finest Home Workshop" Contest!

A Contest to Discover the Best Home Workshop Use of the Finest Tools Made Today

Nothing to Buy

If you now own three or more Delta Power Tools, you are eligible to win up to $1000 merely by sending us a picture of your shop, and telling, in your own words, *why you* like Delta tools. There's nothing to buy, no red tape. And the big prizes are all in the form of good-as-cash certificates which you can redeem at your Delta Dealer for Delta tools of *your* choice!

Easy to Enter

Here's all you do to compete for the big first prize ($1000 worth of Delta tools) and fourteen other valuable power tool prizes:

1. Get an official entry form, either from your Delta Dealer (listed under "TOOLS" or "MACHINERY" in the classified pages of your phone book), or by sending the coupon on this page.

2. In not more than 150 words, complete this statement: "I like Delta Power Tools because . . . " No fancy writing needed. Just tell us, in your own words, why *you* like your Delta Tools. Statements will be judged on sincerity and logic.

3. Take a picture of your workshop that shows the tool arrangement to best advantage. Use your own flash equipment, or borrow a friend's. Pictures will not be judged on professional photographic skill, but on practical arrangement for most efficient use of available space. If there are any special features of your shop of which you are proud, tell us about them in a note pasted on the back of your shop photo.

4. Mail entry form, statement, and photo to: Contest, Delta Power Tool Division, Rockwell Manufacturing Co., Pittsburgh 8, Pa.

DELTA QUALITY POWER TOOLS

Another Product by **Rockwell**

Easy to Win

Remember, you don't have to have an expensive shop to win this contest. Entries will be judged not on the amount of money you've spent to build and equip your shop, but on the common sense you've shown in selecting and using your tools, and on your ingenuity in utilizing available shop space efficiently.

Here are the complete contest rules:

- Contestants must live in the United States or Canada, and own three or more individual Delta Power Tools, or a complete DeltaShop, Delta's one-motor combination of the four basic power tools—saw, jointer, drill press and sander.
- Employees of Rockwell Manufacturing Company or its advertising agency—or members of their families—are not eligible to compete.
- Entries must be on or accompanied by an official entry form. Elaborate or "dressed up" entries will be discarded.
- Contest closes July 15, 1955. Entries must be postmarked on or before that date.
- Winners will be notified by mail on or before November 1, 1955. Complete list of winners will be supplied on request.
- Decision of judges is final. In case of ties, duplicate awards will be made.
- All entries become the property of Rockwell Manufacturing Company, and none will be returned.
- Awards will be in the form of certificates redeemable at authorized Delta Dealers in Delta Power Tools and accessories up to the face value of the certificate.

Get Your Entry Blank NOW!

If you own three or more Delta Tools, you have as good a chance as anyone to win $1000 worth of additional Delta Tools, or any one of the other fourteen valuable Delta power tool and accessory prizes. So get started now! Get your entry form from your Delta Dealer (listed under "TOOLS" or "MACHINERY" in the classified pages of your phone book), or send the coupon below.

Delta Power Tool Division, Rockwell Manufacturing Co.
504B N. Lexington Ave., Pittsburgh 8, Pa.

☐ Please send me an official entry blank for the Delta Users' "FINEST HOME WORKSHOP" Contest.

Name _____

Address _____

City _____ Zone _____ State _____

People Growing Taller, Beds Made Longer

You just have to look at your children and their friends to know that Americans are getting taller all the time. The change is so great that a new standard bed and longer X-ray tables are being made.

Army figures tell the story. The height of the average American man increased six-tenths of an inch between World War I and World War II, and nine pounds were added to his frame. The number of men who are five feet 10 inches and over has increased 45 percent since 1918. The number over six feet has increased 70 percent.

Beds Are Growing, Too

Bed makers had been uneasily aware that the current standard bed, which is just right for a five-foot 10-inch man, was rapidly becoming an anachronism. Odd-sized beds, mattresses, springs, sheets and blankets began appearing. They were snapped up by an uncomfortable public. Standards for "king-sized" beds were needed, and, in consultation with the Commodities Standards Division of the U. S. Department of Commerce, the bedding manufacturers drew up new dimensions.

New king-sized beds, already in production, will measure 82½ inches from end to end. Figuring in the usual six-inch margin, the extra-long mattress will comfortably sleep a six-foot 4½-inch basketball player. It could even accommodate his six-foot 10½-inch teammate, but with no room to spare at the head or foot.

In other fields, adjustable seats in automobiles and controls on factory equipment fit the machine to taller people. One X-ray manufacturer has marketed a new machine with a seven-foot-long table especially designed to accommodate tall patients.

Diet May Increase Stature

No one really knows why man is growing taller. One theory is that a well-fed baby stands a good chance of reaching real physical maturity.

Anthropologists point to small-sized immigrants who entered this country in the last century. Some had been poorly fed in the old country. Their new environment in America did not change their adult physiques, but their children "sprung right up," as one anthropologist put it. END

Build that extra bedroom yourself . . . it's easy!

A few hours of your spare time can turn a dusty attic into that extra bedroom you've always wanted. It's an easy job . . . fun for the whole family. Simply finish the walls and ceiling with Armstrong Temlok® Interior Finish. You'll be surprised at how little it costs, and the finished room will add permanent value and comfort to your home.

1. **You build, decorate, and insulate** in one simple application when you remodel with Temlok. Available in tile, plank, and board forms, Temlok is an inexpensive, easy-to-handle wood fiber material. It's factory finished for lasting beauty, adds fuel-saving insulation to the room.

2. **Walls are no problem** with Armstrong Temlok Plank. The long planks go up fast over wood furring. The exclusive Lok-Bevel* joint makes stapling or nailing extra easy, assures neat, even joint lines. Attractively pre-finished in a random "Suntan Blend," Temlok Plank needs no further painting.

3. **The ceiling's done in no time** with Armstrong Temlok Tile. The Lok-Bevel joint hides all nails or staples, helps you do a really professional-looking job. Temlok Tile comes factory painted in Snow White or Light Ivory. Temlok Tile also comes with noise-absorbing perforated surface.

4. **Some gay decorative touches** and the room is done . . . ready for daughter, son, or overnight guest. It can double as a sewing or hobby room, too. You'll be so proud — and the family will be so pleased — you'll want to "Temlok" the basement next for that much-needed family workshop.

Ask your lumber or building materials dealer for full details on Armstrong Temlok. He'll be glad to show you samples and give you help with your remodeling plans. For your copy of the free booklet, "New Ways to Remodel Your Home," write Armstrong Cork Company, 3702 Washington Avenue, Lancaster, Pennsylvania.

* Trade-Mark

Armstrong TEMLOK

M-67® Monowall® • Cushiontone® • Hardboards • Insulating Wool • Counter-top Cement

GET THE BEST... *MULTIPLIED*

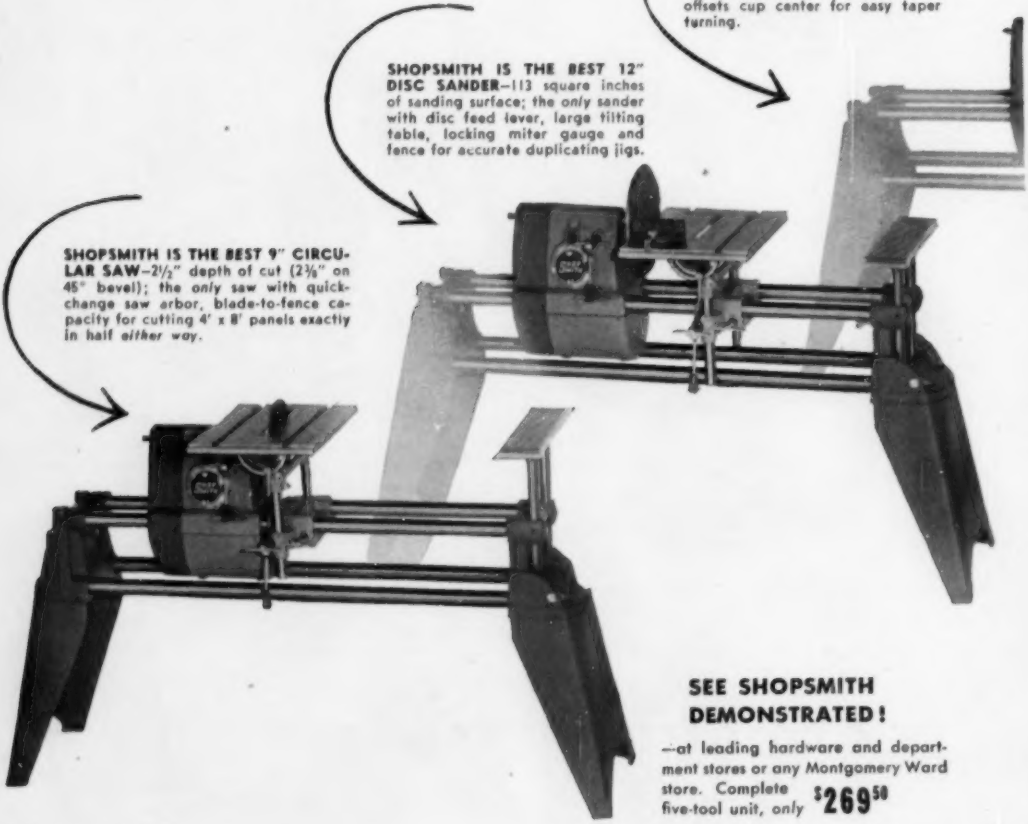
- Not just one "best" tool with makeshift accessories, but the best equipped, *complete* power workshop money can buy!
- Not only the tools you need for doing five jobs well, but the *best* tool for scores of standard and unusual operations!
- Not a shop-full of large individual tools, but a single, compact, movable unit with even greater capacity and precision!
- Not just the best speed for *sawing*, but the best speed for *any* operation, *automatically* set by exclusive Speed-Dial.
- Not only the *most accurate* power tool for the money, but the *safest, most modern, largest selling* precision power tool as well!
- Not delivered "knocked down" for you to put together but completely assembled, fully adjusted, *all ready to plug in!* 19" wide, 71" long.
- Not the $600 you'd pay for comparable tools, motors and benches, but only $269.50 *complete*.

Even your power tool dollars are multiplied with SHOPSMITH!

SHOPSMITH IS THE BEST 34" LATHE—full 16½" swing; the only lathe with universal tool rest that slides parallel to work, dial speed selection, and dial mount which offsets cup center for easy taper turning.

SHOPSMITH IS THE BEST 12" DISC SANDER—113 square inches of sanding surface; the *only* sander with disc feed lever, large tilting table, locking miter gauge and fence for accurate duplicating jigs.

SHOPSMITH IS THE BEST 9" CIRCULAR SAW—2½" depth of cut (2⅜" on 45° bevel); the *only* saw with quick-change saw arbor, blade-to-fence capacity for cutting 4' x 8' panels exactly in half *either way*.



SEE SHOPSMITH DEMONSTRATED!

—at leading hardware and department stores or any Montgomery Ward store. Complete five-tool unit, only **$269.50**

...IN SHOPSMITH*!

SHOPSMITH OFFERS THE ONLY HORIZONTAL DRILL with unlimited side boring capacity, automatic jigging with locking miter gauge and fence, rack-and-pinion table raising for extra doweling accuracy.

SHOPSMITH IS THE BEST VERTICAL DRILL PRESS—drills to center of 16½" circle; the only drill with dial speed selection, dial depth of quill feed up to 4¼", chuck-to-table capacity up to 25", chuck-to-floor, up to 58".

*Trademark Reg. U.S. Pat. Off.

You can do it and do it RIGHT! Dial SHOPSMITH!

Exclusive Speed-Dial eliminates guesswork, assures correct speed for every job. Just set the dial. Speed adjusts automatically—700 to 5200 rpm. No belts to change.

NEW SHOPSMITH HAS POWER-MOUNT!

For quickly adding 4" jointer, 18" jigsaw, paint spray compressor. Permits operation of combination setups—saw-jointer, jigsaw-sander, etc.

"POWER TOOL PROJECTS YOU CAN MAKE"

This book shows you how to turn out professional-quality built-ins, furniture and toys. 30 easy-to-build projects. Drawings and step-by-step photos by the hundreds. Shop hints and short cuts. At most newsstands (Fawcett How-To Book 251) or at your SHOPSMITH dealer! Get a copy today!

MAGNA ENGINEERING CORPORATION
Dept. 293-A at factory nearest you:
12819 Coit Rd., Cleveland 8, Ohio, OR Menlo Park, Calif.

Please rush two free books (1) "What to Look for When You Buy Power Tools," valuable shop guide; also (2) data-packed 20-page SHOPSMITH catalog with complete details, specifications, accessory information.

Name _____

Address _____

City _____ *State* _____

Easy Hookups Show Transistor Wonders

[*Continued from page 218*]

grid, the emitter to the filament, and the collector to the plate.

Transistors are different. Having no filaments, transistors require no A battery. They also work well at much lower voltages than equivalent tubes, usually below 25 volts. With no filament to heat, transistors get to work instantly. They are extremely rugged, long-lived (some makers believe theirs will work 70,000 hours!), compact and light. Battery drain is so low that, in the circuits shown, cells should last almost their shelf life.

Try switching them. FS2500's are tested before shipment and should work in any circuit shown. But they vary somewhat; if you have more than one, try interchanging them for best results.

Be careful about battery polarity. Getting it reversed may ruin a transistor. The NPN's specified normally have the plus side of the power supply to the collector, the negative to the emitter. Don't substitute another type without checking polarity.

Mark battery cases. The flashlight cells must be inserted correctly. Mark the cases with red paint as shown in the drawings. Fit cells with the buttons (positive terminals) at these marks.

Although transistors can be soldered right into a circuit, it is easy to overheat and damage them. The subminiature tube sockets shown eliminate this danger. They also enable you to switch transistors about (always shut off power first).

Prepare the sockets by pushing out two prongs as shown on page 219. Solder the other three prongs to lugs bolted to the panel. Open out socket clips slightly with the point of a pin until the transistor leads just go in without crumpling. It helps to clip them to ¾" length first.

A good milliammeter, although not a must, shows what is going on and will enable you to obtain fullest battery economy. When it is not connected, bridge meter clips with a bit of wire.

NEXT MONTH: Three more breadboard circuits show how transistors can detect light, create tones and even play simple melodies.

Revolutionary new heating system has individual control for each room

Room heating unit is recessed into wall, with only grille projecting. Can be painted to fit any color scheme. Above illustration shows 12,000 Btu unit.

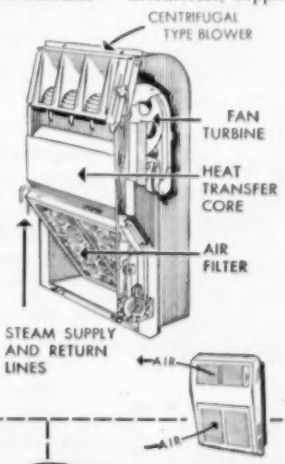
Outstanding comfort and economy. Same steam supplies heat and operates turbine-driven room heater fans

Accurate control of temperature in *each individual room* has long been the goal of heating engineers. Now, with the Iron Fireman SelecTemp system, this is not only possible, but practical and economical. SelecTemp is a unique development in heating, now being enjoyed by thousands of people. Here are a few of the many SelecTemp advantages:

Thermostat in each room. Temperature of every room (including bathrooms) can be varied to fit the preferences of the occupants—and without affecting heat in other rooms. Desired warmth is maintained regardless of changes in outdoor temperature, wind direction or velocity, or of heat from sun or fireplace.

Continuous modulated heat. Each room unit automatically modulates its heat output, ranging from 100% down to 5% of capacity, maintaining a *continuous* flow of filtered warm air. Underheating and overheating, associated with "on-and-off" systems, are eliminated.

Low initial cost. No other system can be so easily and economically installed in new or existing homes or buildings. Costs no more than many systems with only one thermostat for entire house. Small flexible copper tubing (¼ inch nominal I.D.) carries steam to each room unit. Return lines are ⅛ inch I.D. tubing. Unlike "hard" piping, long lengths of copper tubing, easily bent by hand, are snaked into the walls and around obstructions as readily as electric wiring, with a minimum of cutting and fitting. No electric wiring required for thermostats or fans.



Economical operation. Accurate heat control prevents fuel-wasting overheating. *Unnecessary* heating is eliminated. Rooms temporarily unused can be kept cool, but warmed again very quickly, at any time. Each unit automatically regulates its heat output to compensate for warmth from the sun, fireplace or cooking range.

Locate boiler anywhere. Automatically fired oil, gas or coal boiler can be installed in the most convenient place, and yet will supply the required heat to every room.

Compact, efficient room heaters. Room heater units are only 18 inches high. Three sizes: 6,000; 12,000 and 18,000 maximum Btu output. Each unit contains thermostat, copper heat transfer core, spun glass air filter, and quiet aluminum circulating fan, powered by steam turbine. Turbine rotor and fans are mounted on the same stainless steel shaft, which turns on self-aligning Graphitar bearings, requiring no lubrication. Filtered air is continuously circulated, with both air volume and temperature automatically varied according to room needs.

Full information gladly sent. You owe it to yourself to get full information on Iron Fireman SelecTemp heating before deciding on any heating system. Free 8-page illustrated catalog and technical data will be sent you. Just mail the coupon.

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MODULATING ZONE HEATING

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TILTS FROM 46° BACKWARDS TO 7° FORWARD!

Darra POWER TOOLS James

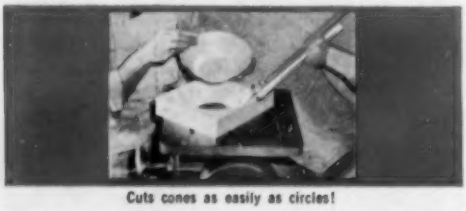
NEW!

TILTING ARBOR BAND SAW MAKES ALL OTHERS OBSOLETE!

Now! Darra-James introduces the first tilting arbor band saw! Makes usual tilt-table band saws as obsolete as tilt-table table saws! Work stays level — eliminates biggest danger to hands! Does intricate work never before practical on band saw! Blade changes in seconds! Double ball bearing! Balanced Wheels! Capacity, 15⅛" at 45° — 12¼" at 90°! Available accessories include rip fence, miter gauge, floor stand, variable speed adjustment.

ONLY $129.50

CONVERTS EASILY TO METAL AND PLASTIC CUTTING SAW!



Cuts cones as easily as circles!

CLIP AND MAIL TODAY!

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☐ Please send me additional information on your tilting arbor band saw.

☐ Please send me your free Power Tool Handbook.

NAME _____

ADDRESS _____

America's Frozen Frontier

[*Continued from page 169*]

"Grab on to something," warned the captain.

The ship was shaking and throbbing with the full 12,000 horsepower of all six engines. We hit the ice. The *Eastwind* staggered, came to a temporary halt, then plowed on, its high, sloped bow literally climbing up on the ice. Snow spray and chunks of ice showered on the deck. Slowly the ship settled, cracking the ice by its sheer weight. Massive slabs, eight feet and more thick, folded upward, climbed up the sides of the ship and fell back.

We had opened a crack. Then we went through, pushing broken ice aside. With roarings and rumblings, we hit the ice again and again, opening cracks and sliding through. This was not only thick ice, it was tough ice. We climbed up on a ridge. Our engines labored. Nothing happened. We were stuck. Capt. Bowerman ordered the engines reversed. We backed off, leaped at the ice again. It cracked. We were through. Then we mounted a hummock that just wouldn't crack. Reversing engines had no effect.

Ship Rolls Out of Icy Grip

Then I felt the ship rolling—rolling while stuck on the ice. Capt. Bowerman was using his heeling tanks, an icebreaker's built-in mechanical roll. As the ship rocked, he worked the rudder and gave the stern a wiggling motion with the engines. (Power can be controlled directly from the bridge.) The propellers were in full reverse. Slowly, groaning as the pressure ice hissed along the sides, we backed down. We were free.

"That one is too tough even for the *Eastwind*," said Capt. Bowerman. "We'll try to get into that lead (a clear-water channel in the ice) to the starboard." He gave the orders and in a few minutes we were through the lead and in a polynya. This is a lake of open water big enough for an icebreaker to turn around in, giving her a chance to backtrack.

Our helicopter, which had taken off

[*Continued on page 266*]

Meet the power leader of the *Super-Quiet* SCOTT-ATWATER line!

SCOTT-ATWATER
30 H.P. $459.50
WITH ELECTRIC
STARTER $549.50
FOB Factory

Here's your partner for glorious outboarding adventure—a motor with that vital *extra* power that means breathtaking speeds and flashing acceleration.

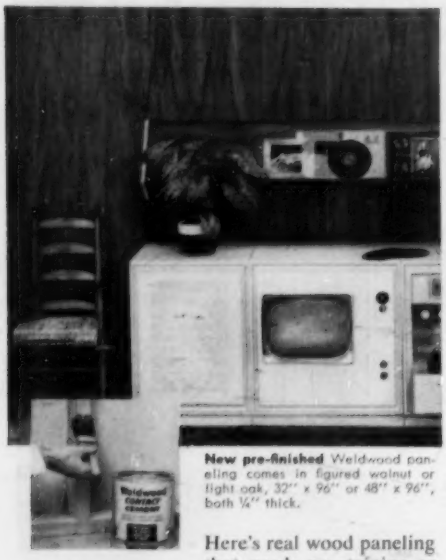
The Scott-Atwater 30 h.p. brings new luxury to outboarding with *Bail-a-matic* power bailing; smooth, quiet *Hush-Spring* Mount, *Aquamute* Exhaust, Intake Silencer; Push-Button Electric Starting (optional); Complete Shift with Safety-Zone Shiftlock; new Free-Flow V-Valves; Automobile-Type Dual Exhausts; Remote Control Connections; *Stowaway* Fuel Tank; Snap-off Hood.

See this new pacemaker among quality outboards at your dealer's now—his name is in your phone book classified section. Or send for free color booklet on the full line: 30, 16, 10, 7½, 5 and 3.6 h.p. Write Scott-Atwater Mfg. Co., Inc., Minneapolis 13, Minn., Dept. PS-25.

Horsepower certified by OBC.
Price information subject to change.

FIVE *Super-Quiet* SCOTT-ATWATER MOTORS... AND THEY ALL BAIL YOUR BOAT!

NEW! BEAUTIFUL PRE-FINISHED HARDWOOD PANELING YOU PUT UP WITHOUT NAILS!



New pre-finished Weldwood paneling comes in figured walnut or light oak, 32" x 96" or 48" x 96", both ¼" thick.

Brush Weldwood Contact Cement on studs and panel backs at points of contact. Let dry ½ hour and repeat. When dry, position panel, tap with hammer and wood block — job's done!

Here's real wood paneling that needs no staining or waxing—and you install it with a brush! New Weldwood panels come already *pre-finished* and waxed by expert wood craftsmen. You can put them up with new Weldwood Contact Cement—no nails, no hard-to-cover-up nail holes.

Panel a wall in your living room, dinette or den—Weldwood gives a lift and sparkle to the whole room. An 8' x 12' wall in pre-finished walnut costs about $78 — other unfinished decorative paneling from $23 for 8' x 12' area. See your lumber dealer for pre-finished and regular Weldwood paneling and superior Douglas Fir Weldwood, or visit any of the 73 United States Plywood or U. S. - Mengel Plywoods showrooms in principal cities.

Ask your lumber dealer for

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Pre-finished Hardwood Paneling

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World's Largest Plywood Organization

55 West 44th Street, New York 36, New York

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America's Frozen Frontier

[*Continued from page 264*]

from the aft-flight deck before we hit the ice, was hovering ahead. The pilot was radioing back the location of leads and cracks between the giant floes.

Those heeling tanks we used are one of an icebreaker's last-resort tricks. On each side, amidships, are tanks with a capacity of 150,000 gallons of sea-water ballast. They are connected by 24-inch lines, permitting 104 tons of water to be pumped from one side to the other in 90 seconds. This provides a man-made roll of 15 degrees from port to starboard and back, enabling the vessel to rock itself loose when stuck in the ice. There are similar tanks from which water can be pumped forward or aft.

Eastwind *Can't Make It*

Despite her impressive power, the *Eastwind* did not reach Alert last summer.

In Lady Franklin Bay, heavy polar ice punched a big hole in her bow. She was able to proceed, however, to the Lincoln Sea, where, not far from Alert, ice broke the blade of one propeller.

Capt. Bowerman summoned the *Westwind* from Thule to take over the mission. The *Westwind* took on the *Eastwind's* cargo and proceeded north. She reached the Polar Sea, where a propeller blade was broken by the ice. About five miles from Alert, the *Westwind* became stuck fast in the ice pack. After a few weeks, strong winds shifted the ice, freeing the ship.

This ice-crushing run to Alert is the supreme test and achievement of an icebreaker. When the U.S. Navy's new, bigger and more powerful *Glacier* gets her baptism of ice, she undoubtedly will put in an early bid for the honor of carrying her Polar Bear flag up to Alert at the top of the world. END

Note for Motorists

In life as in baseball, it is the number of times you reach home safely that counts—*Sign in Itasca State Park, Minn.*

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SKIL

2¼" Belt Sander

Anybody can get professional finishes with this SKIL Belt Sander. It's so easy to handle—lightweight, compact, smooth-operating . . . in any position. Sands flush to vertical edges and corners. It will handle all your jobs, from rough to final finishing.

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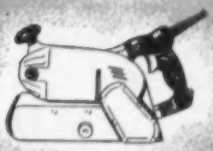
Dependable, long-life combination worm and chain drive.

Extra power motor, high quality long-life bearing.

Comfortable, hand-fitting handles.

Flush sanding belt for reaching into corners.

Trigger switch in contour handle. Instant control.



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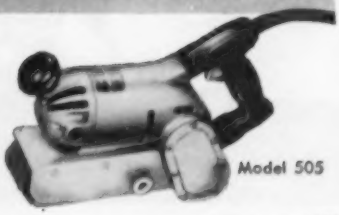


Model 505

HALF CLEAN ISN'T CLEAN ENOUGH

. . . in motor oil, too!

Half-clean oil wears an engine. Clean oil protects an engine. And Hastings Oil Filter Cartridges—when replaced as normally recommended—*keep oil clean from filter change to filter change!*

The reason for Hastings amazing performance is Densite—a new filtering material that absorbs dirt through its *entire* depth. And only Hastings has Densite!

Next time you change oil—change your filter cartridge, too. Ask for Hastings and have clean oil all the time!

Packard Glides on Torsion Bars

[Continued from page 158]

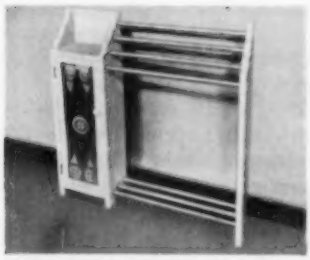
Thrust, dive, squat. This ugly trio constantly bedevils suspension engineers. The rear springs in a conventional Hotchkiss drive have the extra job of sending engine and brake forces along to the chassis. In Packard, the torsion bars are spared this task, which is taken over by two pressed-steel torque arms. They run from the rear axle to the frame X member, and they do a lot for the car.

During hard acceleration, the axle thrust transmitted to the frame is both forward and *upward*, which helps counteract squat. During hard braking, the axle torque sent along the arms tries to hold the frame *downward*, partly washing out the dive. Neither tendency is wholly canceled—the engineers don't think it should be—but in both traits the car has gone from poor to fine.

A particular advantage of coupling front and rear wheels to a single bar per side is that the frame doesn't have to cope with twisting forces and local spring loads. Body and chassis simply float on four points, the four arms at the ends of the bars; and the body itself doesn't get wracked when the supporting surface is uneven. As a stunt, Packard people like to slam a sedan across a rough diagonal railroad crossing with the car doors on the "ajar" latch. That there is practically no rattling shows, they claim, that body twist doesn't occur. We made crossings of such ferocity as would, on my own car, have popped open the glove compartment and unlatched the hood, and the most the Packard did was utter a few muted clicks.

Leveler. So far, the suspension would give a soft ride and improved handling but it wouldn't do much—except with one specific load—for such other headaches as bottoming, changing height drastically, and having the headlight aim messed up by a load of luggage in the trunk. (A car must cope adequately with anything from one 100-pound lady driver to maybe 1,200 pounds of portly passengers and luggage.) Hitting bottom—

[Continued on page 270]

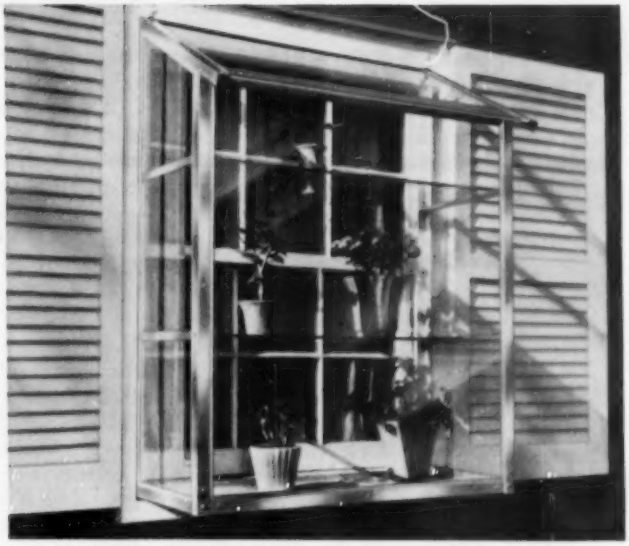


Bathroom Valet. Handiest addition your bathroom could have. Decorative storage cabinet door is made of hammered aluminum sheet. Requires wood, Do-It-Yourself Aluminum Tubing and sheet. Easi-Bild Pattern #29.

Serving Tray. Combines serving tray and stand in a useful and beautiful piece of furniture. Aluminum, Weldwood, Naugatop, Redwood and fasteners provide needed materials. Easi-Bild Pattern #52.

Weathervane. Pennsylvania Dutch design enhances the appearance of your house. Aluminum tubing, sheet, fasteners and wood are all you need. Easi-Bild Pattern #524.

Look for this rack containing Tubes • rods • bars • a wide variety of sheet designs • angles • fasteners • screen and storm sash sections • window hardware • Reynolon plastic film • trim strip.



Window Greenhouse. Have your own window conservatory—green things growing all year long. Can be made to fit any window. Requires glass, Do-It-Yourself Aluminum storm sash sections, angles and fasteners. Has three 14" glass shelves. Easi-Bild Pattern #566.

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Now is the ideal time to start any or all of these new do-it-yourself projects. Easy and quick to build whether you have a workshop or not. New Easi-Bild† patterns are simple to follow. Your nearby hardware or building supply dealer has Reynolds *Do-It-Yourself* Aluminum and dozens of suggestions for other uses.

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Enclosed please find $ _____ for the following Easi-Bild patterns:

- ☐ No. 29 Bathroom Valet—35¢
- ☐ No. 52 Serving Tray and Table—25¢
- ☐ No. 524 Weathervane—35¢
- ☐ No. 566 Window Greenhouse—50¢

Name _____

Address _____

City _____ Zone _____ State _____

Packard Glides on Torsion Bars

[Continued from page 268]

which happens when the springs run out of jounce space and the axle housing blips rubber bumpers—naturally occurs much more readily when a large static load has already consumed much of the jounce space.

The answer is ingenious and brand-new (Packard favors the word "revolutionary"). Essentially, it is an extra pair of torsion bars that are automatically wound up by increased load.

Here's what happens:

Motor takes over. Two half-length bars are attached in back close to the main bars. In the middle of the chassis, by the X-member intersection, a geared-down electric motor is placed so that it can wind up or unwind the other ends of these leveling bars. A collar strapped around one of the main bars tells a control system whether the car is down in the stern or down in the bow. Then the control system tells the motor to start up, and which way to run. Levers twist the half-length bars just enough to raise or lower the rear until the car is level.

This mechanism, which is almost inaudible, keeps the body within a fraction of an inch of design height with full load. Hitting bottom while fully loaded, although possible on a jehosaphat of a bump, is extremely rare. Headlight aim stays right no matter how many suitcases you pile in the trunk. Caster angle in the front suspension is correct all the time, not just for one specific load. And the car looks better, resembling the slinky vehicles in advertisements.

Because it isn't practical to have the leveler working like crazy every time the car hits a bump—it wouldn't react in time, but it'd wear itself out trying—the control system has a six-second time delay built in. If you take plump Aunt Eppie for a ride, the car sags noticeably when she clambers in back. But she scarcely settles herself comfortably be-

[Continued on page 272]

IT SMELLS GRAND

SNIFF IT! YOU'LL SAY "THAT'S FOR ME!"

IT PACKS RIGHT

CUT TO PACK IDEALLY!

IT SMOKES SWEET

JOY YOU'VE DREAMED OF — YOU'LL AGREE!

IT CAN'T BITE!

SIR WALTER RALEIGH'S BLEND OF CHOICE KENTUCKY BURLEYS IS EXTRA-AGED TO GUARD AGAINST TONGUE BITE.

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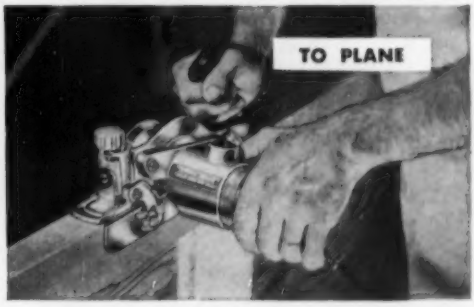
24-PAGE BOOKLET ON PIPE CARE. JUST WRITE TO: SIR WALTER RALEIGH DEPT. F5, LOUISVILLE, KY.

The Right STANLEY Tool

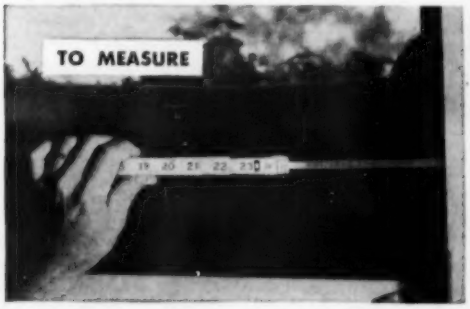
The rugged little work horse of the workshop in 90% of your woodworking jobs. Versatile, light weight and high speed, its motor is used to power the plane shown. *H15 Router — $39.95.*



This tool is a wonder for smooth and easy planing. Just right for fitting storm and screen doors and windows, trimming wood, plastic or aluminum veneers on table and counter tops. When you have H15 Router, Kit is all you need to convert to power plane. *H106 Plane Adapter Kit — $29.50.*

New! Router-Plane Kit

Combines H15 and H106 with gauge and bit in handy fitted carrying case. *H100 — $89.95.*



Accurate measurement is fundamental in jobs of all kinds. Here is a new Stanley Zig-Zag Extension Rule with accuracy-plus features. Extra thick first leg has brass slide for inside measurements. Rule opens to even numbers, convenient marking gauge at 2", 4", 6", 8", etc. Plastic finish on sticks and nickel silver joints ensure longer useful service. *6 ft. No. X246 Extension Rule — $2.10.*

The standard for mechanics, repair men and well-equipped handymen everywhere. Just a push for lead holes in plaster or wood. Handle returns automatically after every stroke. Drill points cannot pull out when tool is in use. All metal, chromium plated, with 8 drill points in magazine handle. *No. 41 "Yankee"® Push Drill — $6.00.*

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CARTER CARBURETOR CORPORATION
St. Louis 7, Missouri
Division of American Car and Foundry Company

Packard Glides on Torsion Bars
[Continued from page 270]

fore the leveler gives a faint hum and the car comes back to normal height. This also works in reverse: If six people pile rapidly out of the car, it rises momentarily above normal, the faint hum occurs, and down it goes.

Automatic exceptions. Packard engineers built two other restrictions into the gadget besides the time delay. They didn't want it to work during braking—which may easily continue for more than six seconds—because the forward weight shift can improve stopping characteristics. So they wired the leveler through a special stop-light switch so that it doesn't get juice when your foot is on the pedal. And if you get a flat tire, using a bumper jack with the leveler at work is wildly exasperating, because the thing tries valiantly to make the other end of the car come up, too. So there is a "flat-tire switch" under the dash that cuts out the leveler and allows you to jack with only normal annoyances.

Prospects. Torsion bars aren't new, of course; several European passenger cars and most U.S. racing cars have gone to them. (Ordinarily, though, they are frame-anchored at one end.) The leveler does seem to be wholly new. It neatly solves problems that, while troublesome, are perhaps more vexing on spare-no-expense vehicles than on the heaps that most of us drive. The improvement in handling is notable, though perhaps enhanced by Packard's past problems in this department. The company admits to a slight weight penalty (less than a hundred pounds) and slightly higher costs.

Transmission. Until this year, Ultramatic drive has been noted more for smoothness than for zip. It combined a two-stage torque converter with a lock-up clutch that gave direct drive once the car got rolling. In the '55 version, the selector quadrant has two Drive positions, and in one you get the same sedate behavior you got before. In the other, it really lays back its ears.

At moderate throttle in the new set-

[Continued on page 274]

YOU CAN START A $40 A DAY BUSINESS IN YOUR SPARE TIME

Andy Phillips says: "My BELSAW Sharp Smith gives me big profits at low expense — I can run 35 to 40 circular saws in an 8-hour day — that makes me $40 cash."

"I also get BIG EXTRA PROFITS . . . up to $4 an hour . . by grinding planer and jointer knives — there's always a demand for this kind of work."

You can start this REPEAT CASH business in your own home or garage while you are working at your regular job. Easy to operate, no experience needed. "Pays for itself from just 65 jobs." — *Harvey Jensen*

For as little as $15 down payment, you can get your BELSAW SHARP SMITH rushed to you.

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it's easy with Gold Bond Fireproof Grainboard!

GIVE your kitchen that warm, cozy pine-paneled look with Gold Bond Gypsum Grainboard. It has all the expensive beauty of fine wood paneling, at a fraction of the cost. Sturdy, fireproof Grainboard is available in two convenient widths — 4 ft. panels or handy 16-in. planks . . . in Knotty Pine, Bleached Walnut and Dark Walnut. It's ideal for finishing off old walls or adding a den or gameroom.

Lightweight and easy to work, Gold Bond Gypsum Grainboard goes up fast — covers large areas at a time. A hammer and knife are the only tools you need. Cuts easier than wood...just score and snap to fit.

In new construction, these panels can be nailed to studs. Or, in remodeling, you can nail them directly to old walls or over furring strips. Gold Bond Gypsum Grainboard Planks, also excellent for home modernizing, can be quickly laminated over existing surfaces.

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Packard Glides on Torsion Bars

[Continued from page 272]

ting, you get away by converter plus low-range planetary gearing, with a discreet upshift occurring in the 20s or 30s. At full throttle the box dishes out a maximum torque multiplication of 5.22 to 1, which gives theatrical getaway. If you hold full throttle, there's a forced upshift to high around 40 m.p.h. But if you give *more* than full throttle (by keeping the gas in the kick-down spot) this upshift will be "inhibited," and you can wind the poor thing up to a hysterical 5,000 revs or so, then ease back to plain full throttle for the automatic upshift.

New V-8s. Despite their long fondness for L-head straight eights, Packard people are old hands at V-type engines;

The easiest way to find out what's on your wife's mind is to sit yourself down in a comfortable chair.
—THE SIDEWALK SUPERINTENDENT

there were the famous Twin Sixes of 1915-23 and the Twelves of 1932-39. So it isn't surprising that they get into the act like veterans:

- Though there are three power ratings, there are two blocks, differing only in bore, that have displacements of 320 and 352 cubic inches ('55 comparisons: Cadillac and Chrysler have 331, Lincoln 341).
- Both engines have the same 3.5-inch stroke, and use the same con rods and bearings. Although one has a bore of 3 13/16 inches and the other four inches, the cylinder heads and camshafts are interchangeable, and the former will fit on *either* bank.
- Obviously planned with one eye on modern torque demands, the engines are husky enough to loaf most of the time. Ratings: 225 hp. at 4,600 r.p.m. and 325 pounds-feet of torque at 2,600 for the 320-incher in the Clipper Super and Deluxe series; and 245 hp. and 355 pounds-feet for the 352-incher in the Clipper Custom. Installed in the Packard series, the big baby is rated at 260 hp. and 355 pounds-feet. END

150 MILES PER GALLON!

Engineers have done it! You can shoot for it. Make the start toward this unbelievable but **possible** economy with a perfect car, a perfectly tuned and efficient engine.

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Squeeze the self-depositing mineral compound into each piston (as directed). Fills in scores and worn areas of rings and walls, restoring **compression and power.** Pays for itself in a few days in reduced gas and oil usage.

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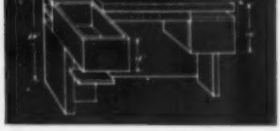

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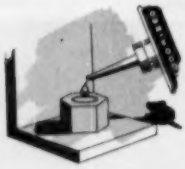

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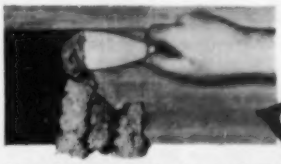

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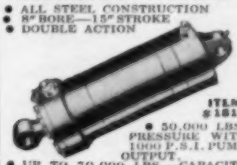

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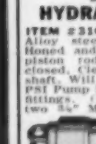

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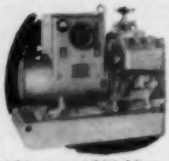

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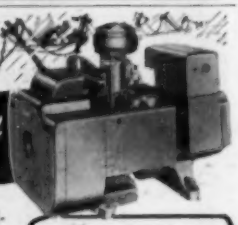

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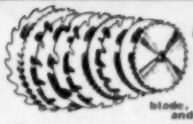

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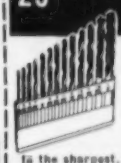

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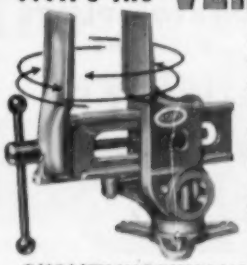

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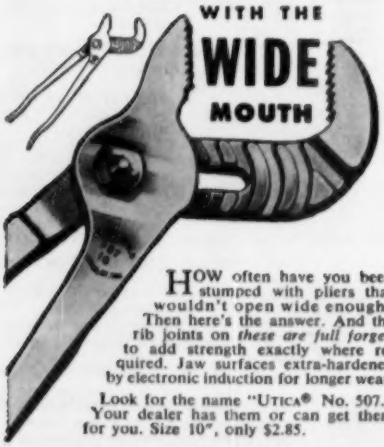

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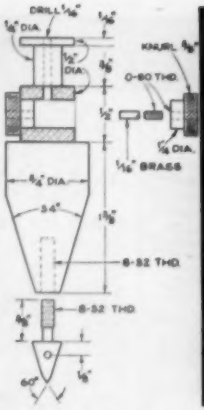

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Centerdrill the body stock and true up between centers. Then drill the cross hole on a V block or crotch center. Also cross-drill a piece of ⅛" stainless steel for the point. Face this piece off ½" from the 1/16" cross hole, cut the 8-32 thread and undercut the shoulder. Reverse and centerdrill the other end.

Chuck the brass body true, face 11/16" from its cross hole, and turn the rim and shoulder .500". Drill the cord hole through.

Reverse the piece to hold it in a ½" collet, face off, drill and tap ½" deep. Then screw in the prepared point, run in the tail center, and turn body and point to shape. Finally, slide back the tail center and finish the 60° point with very light cuts.

Turn the two knobs and thread the brass pin. Solder the unthreaded end into one knob, assemble in the body, and spot the center of the pin for the cord with a drill run through the bob.—*O. W. Hopkinson Jr., New Kensington, Pa.*

Magnet Tests Stainless Steel

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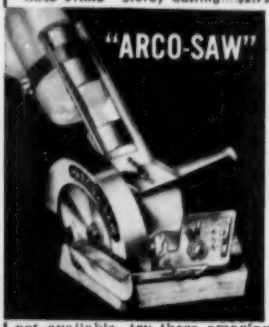

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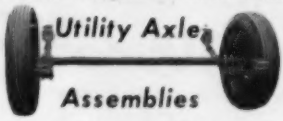

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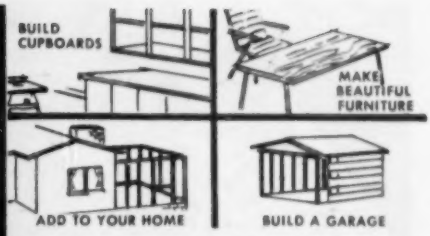

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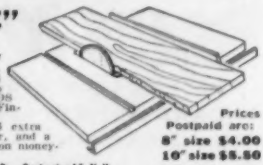

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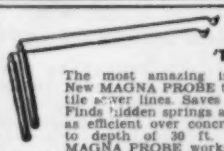

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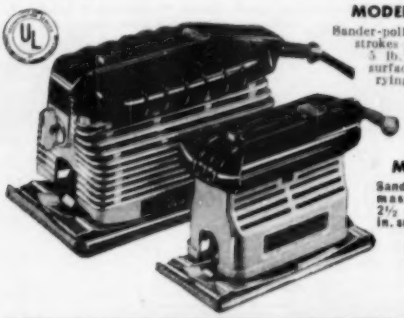

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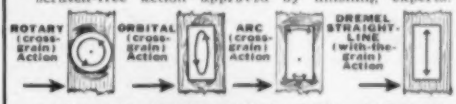

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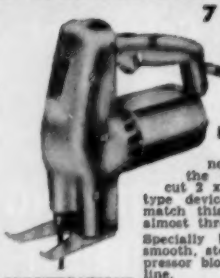

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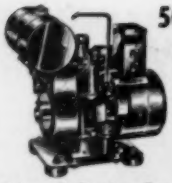

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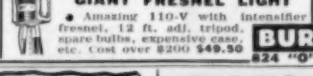

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(See previous recent issues of this magazine for details.)

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- Selsyn Synchronous Motors (pr.) $12.97
- Portable Govt. Air Tank $15.95
- DeLuxe Army Tool Chest $21.95
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Model 10W, 10" with Cutter $2.60

World's HANDIEST Do-It-Yourself Tool!

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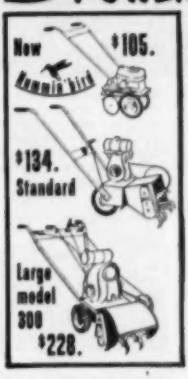

Whatever your need, you can afford one of the models in the 1955 ROTO-HOE line. Complete rotary tillers from $105. to $228., all with low cost year 'round use attachments.

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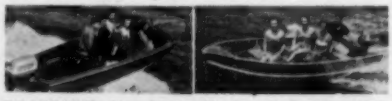
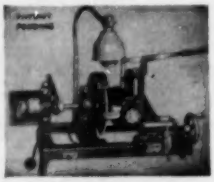


WAGEMAKER CO., Dept. 59, Grand Rapids, Mich.



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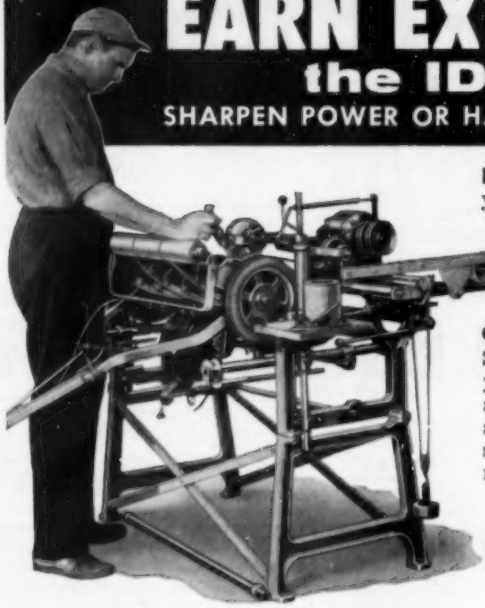

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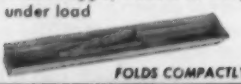

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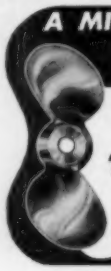

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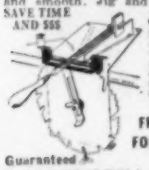

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Combination bit for electric drills. Use as a drill, saw or reamer. Use for circles, ovals, squares, inside, hard-to-reach work. Works equally well in metal, pipe, wood, plastic, etc. Easy to use. Every carpenter, mechanic, electrician, plumber, hobbyist needs one. Made of abrasive resistant, hi-speed steel. Stands severe, continuous use without breaking. Resharpened free. Use with electric drill, slow drill press, lathe or milling machine. 1" diameter, 2" cutting section, total length 3½". 3 types—wood, metal or all purpose. Set of 3, $5.75. Details on request. Dealer inquiries invited. *Money Back Guarantee.* Shipped same day. Send check or money order to:

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ARIENS 'Yardster'*

* interchangeable attachments for preparing and cultivating garden . . . mowing lawns, cutting weeds . . . spraying trees and plants . . . clearing snow from walks, drives.

Prepare garden without spading . . . cultivate all season without hoeing using the famous Ariens Yardster rotary tiller — now at a new low price — **only $166.50.** Self-propelled with 2-speed wheel drive — merely guide it! With mower, sprayer and sno-thro attachments it's unequalled for construction, looks, performance and price. See it soon!

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PLANS only $1.00 EACH POSTPAID

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- Proved performance. Nationally advertised and sold for 7 years. Satisfied customers around the world

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- 10 in. blade cuts 3¼ in. deep, tilts full 45 degrees
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- Cast aluminum miter gauge and self-aligning rip fence guide

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Same Kit with 10" Combination Blade **$25.90**
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- Cuts to center of 24 inch circle
- Handles stock up to 6 inches thick
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- Lower wheel and drive pulley runs on sealed New Departure Ball Bearings; Upper wheel runs on two ⅝" bore Oilite Bronze bearings.
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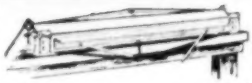

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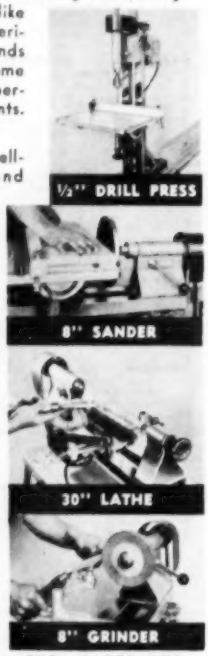

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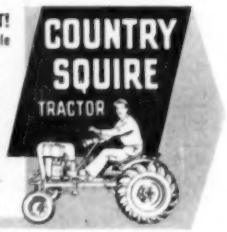

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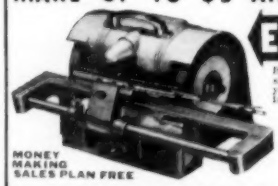

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NEW 3HP WISCONSIN AIR COOLED GASOLINE ENGINE

An ideal power supply for small farm machinery, air compressors, lighting plants, power tools, small boats, etc. It is a single cylinder, 4 cycle, 3HP gas engine. Air cooled. 2800 RPM. Has a 2½" × 2¼" Bore. Comes with Oil Bath Air Cleaner, self-contained Gas Tank & Gauge, Carburetor, Flywheel, etc. Waterproofed. New, in original packing. **59.50**

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NEW — ARMY SURPLUS

Originally used as a warning horn. Ideal for Car, Boat, Truck, fog horn, alarm horn, etc. Will operate on as little as 10 lbs. air pressure. Has hand pump. Horn 12" lgth. Pump 20" lgth.

HORN ALONE 7.95

PUMP & HORN 12.95

180° OFFSET DRIVE

NEW

For use where tremendous power at low take-off RPM is desired. 6 gears rotate on self-lubricating, hi-speed roller bearings. 85 to 1 gear ratio. Shafts are 1¼" & 3/8" dia. All NEW! **12.95**

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U.S. Navy Gun Control Phones. "Sound" powered — no other power needed. Ideal for any point-to-point within a radius of 1/2 mile. Each set includes 2 phones on chest plate, 2 headsets and approx. 35 ft. of wire. Now ONLY **9.95** PER SET

NEW 1/5 HP ELECTRIC MOTOR

A 1/5 HP, reversible series wound motor. Turns at 3800 RPM. Operates on 27 volts DC, 16 amps. Has a 12 spline, 9/32" diameter shaft. Size: 4-1/8" × 2-3/8". A NEW surplus bargain **3.95**

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NEW

Made by Marshalltown Mfg. Reads 0 to 200 PSI. Has a 3-1/2" white face. Has 28" hose with fittings. Steel case. **2.95**

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Chamois lined, rubber covered frames. Has REPLACEABLE GROUND LENSES in either clear, amber or green. Frames have special non-fogging breather slits. Nose bar is adjustable. Specify lens color. NEW ONLY **2.49** $5.00 VALUE

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BENCH TESTED — RECONDITIONED

Suitable for adaptation to home welding units, portable and rural lighting, power plants on boats, etc. Fully reconditioned and guaranteed serviceable.

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PI	200	24	19.95
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ARMY PICKMATTOCK

Small, easy to use has 12" steel head with mattock one side pick on other. Has hardwood handle & case **1.29**

PORTABLE SHOVEL

NEW — New G.I. Surplus. 20" Hardwood handle. Blade folds to form pick. Carry in car for emergency in snow or mud. NEW **1.29**

DC METERS

AMMETERS

0 – 30	0 – 240	30 – 0 – 30
0 – 60	0 – 490	50 – 0 – 50
0 – 120	0 – 300	60 – 0 – 60
		120 – 0 – 120

4.95 EACH

All Voltmeters & Ammeters are NEW and have 2" face (except 0-300 which is Used and has 3" face) Manufactured by Westinghouse, G.E., & Weston.

NOTE: External SHUNTS are required on DC AMMETERS.

SHUNTS – with meter $1.35
SHUNTS – without meter . . $1.65

NEW 0-30 VOLTMETERS **4.95** EA.

BOLO KNIFE AND CASE

Made of top quality steel. 15" long. Ideal for clearing brush, etc. Comes complete with sturdy belt sheath. . . . **1.98**

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U.S. Navy Portable Search Spotlight. Has pistol grip & aiming sight. Makes ideal search, signal, spot or an emergency light for boat, car, camp, etc.

12 volt light – " lens . . **4.29**
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1/10 VALUE — **28.75** WITHOUT MOUNT

Ideal for Machine Shops, Garages, Trucks, Jeeps, Boats, Boat Yards, etc. Hoist has a 2500 lb. lift capacity through a 24 to 1 gear ratio. Has a bronze worm gear drive. Complete with 18 ft. of 3/16" high tensile, steel cable. NEW!

HOIST WITH CLUTCH
Same as above but has special free-spool, pull-out clutch. **29.75**

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This selected LUAN MAHOGANY meets rigid Gov't Specifications. It is **WEATHER** and **WATER RESISTANT**. You'll be amazed at the beauty of this fine wood. Its rich golden elegance will thrill you. Rotary cut for beauty and grain. Both sides sanded and ready to use. Bonded with finest resin adhesive. Face side unjointed. Ideal for paneling DENS, OFFICES, HOTELS, CABINETS, etc.

3 ft. × 6 ft. × 3 mm approx. 1/8" 18 sq. ft. A $5.00 VALUE **1.79** FULL SHEET — Min. order 8 sheets

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3400 RPM ½ HP POWER SAW

19.98 Complete with 5¼" Blade

CUTS THROUGH A 2 × 4 LIKE A KNIFE THROUGH BUTTER RIPS — CROSSCUTS

NEW

A rugged, professional type, adjustable saw. Cut any angle, 0 to 45°. Has adjustable (0 to 6") rip fence. Safety-trigger switch on handle. Full ½ HP Universal AC DC, 110 120 Volt, 60 cycle motor. Weighs only 6½ lbs. A sensational Value. We sold over 700 Saws in Los Angeles in one week.

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SPORTSMAN'S 12 Pc. IMPORTED COMBINATION KNIFE

Complete with Genuine Leather Holster!

NEW

Eliminates 12 Individual Items from your Pack or Tool Kit!

(A $12.95 VALUE) **4.95**

Here is the Perfect Combination Knife Tool for every Outdoor Sportsman, Hunter, Camper, Fisherman, Boy Scout, Ranger, Rancher, etc. Think of it! 11 Fine quality Steel Tools, precision made to fold easily into the heavy bone covered body in one neat, compact unit you have (1) a regular knife, (2) a fork, (3) a spoon, (4) a drop knife, (5) a bone saw and fish scaler, (6) scissors, (7) a can and bottle opener, (8) a cork screw, (9) awl punch, (10) a screwdriver and (11) a metal file. All this PLUS a genuine leather belt holster.

ORDER NOW While We Can Guarantee Delivery at this Special Low Price

U.S. NAVY SHEEPLINED FLIGHT JACKET

An extra heavy Winter Jacket. Made to top Gov't specifications. Fully lined with thick, soft sheepskin pelt. Full sheepskin collar. 2 large patch pockets. Full length, heavy duty zipper. Adjustable waist straps. Knit stern cuffs inside the sleeves. Outside top quality, brown horse hide. Sizes: 36 and 48. **24.95**

FLEECE LINED LEATHER PANTS – Heavy duty leather, fully lined. Legs have 3/4 length, heavy duty zippers. 2 large knee pockets. Zipper fly. Sizes: Small, Medium, Large. **8.95**

COMBINATION OUTFIT (Pants & Jacket) – Both above. **31.50**

NAVY FLEECE LINED FLIGHT BOOTS

Fully wool fleece lined, including insole and tongue. Finest leather upper, 100% waterproofed. Rubber shoe has heavy non-skid sole. Double zipper closure. One zipper is quick release. Laces up back for snug fit. Size: Small, Med. Large and Extra Large. A $22.00 Value for Only . . . **10.88** PER PR.

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Coming Next Month:

The 1955 Boat Show

EVERY month a representative group of POPULAR SCIENCE MONTHLY's readers is invited to tell the editors what they read and don't read, what they like and don't like, about this magazine. Thirty-three percent of these spokesmen for the readers indicated last fall that they wanted more news and features about boats and boating—inboard, outboard and overboard.

So next month there'll be a boat show in this magazine—one that you can see at your leisure, wherever you happen to be, without elbowing your way through crowds. If you have a boat, want a boat, or simply enjoy knowing about boats, be sure to read the March issue of POPULAR SCIENCE MONTHLY.

"My Title Has No Car"

[*Continued from page 135*]

now can bring 10 years in Sing Sing. In New Jersey, to register a car you must have either the manufacturer's certificate of origin or a verification of registration for the past two years. These show that the car has not been stolen since it left the factory, or in the past 24 months.

In Memphis, Tenn., no one can sell a car to a dealer without registering his right thumbprint and signature on the bill of sale. Then the dealer must report all sales to the cops, and not resell for 24 hours to give them time to check all stolen-car lists.

A Master List for Master Thieves

Manufacturers are putting secret numbers on inaccessible parts of every car made. Where and what these are is a closely guarded secret, but all cars can be identified by them. The National Auto Theft Bureau, a nonprofit outfit owned by insurance companies, maintains a master list of all stolen cars that were insured. You can call a National Auto Theft Bureau office—in major cities—and check against the list to see if a car that you are being offered has been stolen.

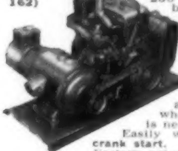
There is, according to J. Edgar Hoover, an auto theft every 2.3 minutes. Thus if you spent 15 minutes on this article, six cars were stolen before you had read it through. "The value of the property taken in automobile theft," says Mr. Hoover, "exceeds the value of property taken in all other crimes combined."

The title-switcher's whole goal is to hand you a few thousand dollars of this staggering annual loss. END

PORTABLE LIGHT PLANTS

HI-LINE 6000 WATT PLANT

(Item 162)



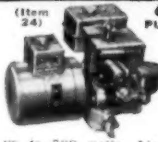
Push Button Start 115-230 v. 60 cyc. A.C. A brute of a power plant with a rugged 14.6 hp. Wisconsin engine. Plenty of electricity for ranges, water heaters, freezers, pumps, machinery, etc. Affords both 110 and 220 volts. Ideal where heavy current is needed. Wt. 590 lbs. Easily worth $995. **With crank start.** Factory price **$585.50**

Same plant, but **with self-starter, $645.00**

Generator and control box only, belt driven. Use your own engine or tractor. Wt. 240 lbs. (Item 163) Factory price **$345.00**

BUY —DIRECT— FROM FACTORY SAVE MIDDLEMAN PROFITS

(Item 24)



600-700 WATTS

PUSH BUTTON START

115 v. 60 cyc. AC Powered by a rugged 2 HP easy starting Briggs engine. No wiring necessary; just plug in and operate. Plenty of current for any oil burner, freezer, brooder, emergency lights, etc. which require up to 700 watts. Ideal for television and radios. Complete with Voltmeter and built-in winding to charge 6 v. auto batteries. (Item 24.) Wt. 75 lbs. Easily fits in car trunk. Be prepared if storm knocks out power lines. Reg. $275 value **$143.50**

1000-1200 Watt Plant (Item 45) same as Item 24 but larger generator and engine with 50% greater output **$199.50**

LITTLE GIANT—350 WATT (Item 273) 115 v. DC 1½ hp. Briggs engine. Perfect for lights, radios, chain saws and power tools. Wt. 65 lbs. **$99.75**

PORTO-POWER

1500-1750 Watt Plant

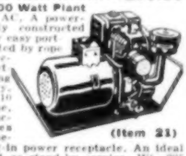
115/130 v. 60 cyc. AC. Push button start. Powered by a 4.5 HP Briggs engine. Combines compactness and easy portability with higher output for handling heavier starting loads. Ideal for operating oil burners, sump pumps, freezers, television, lights, **communication systems, etc.** Perfect for **contractor's power tools.** (Item 20). Wt. 146 lbs.

(Item 20)

Factory Special Price **$279.50**

MASTER-LITE 2500 Watt Plant

110/120 v. 60 cyc. AC. A powerful plant, ruggedly constructed and yet designed for easy portability. Can be started by rope or built-in 12 v. electric push button starter. Built-in winding to charge battery. Powered by a big 5.10 HP Briggs engine, complete with all accessories. Includes control box, voltmeter, and handy plug-in power receptacle. An ideal plant for permanent or stand-by service. Wt. 225 lb. Reg. price $645.00



(Item 21)

(Item 21) Factory Price **$329.50**

Dual Voltage 110/220 available for above plant for $30.00 additional.

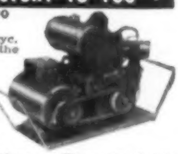
3500 Watt Plant Push Button Start (Item 23) 115 v. 60 cyc. AC. Similar to above, but larger and 33% more capacity. Wt. 270 lbs. Reg. $760. Factory Price **$379.50**

3500 Watt Dual Voltage Model—Similar in design to Item 21 above, but with 110/220 3 wire output. Affords choice of either 110 or 220 volts. (Item 23 d.v.) **$409.50**

We make fully automatic controls to operate any of the above light plants. Write for details. We make all sizes up to 25,000 Watts.

FROM FACTORY TO YOU

GIANT 2000-2500 WATT PLANT



110-120 v. 60 cyc. AC. absolutely the best made — exclusive dynamically balanced armature; heavy windings develop up to 5000 watt overload for motor starting. Skid mounted — portable. Powered by an easy starting Briggs or Wisconsin 6 HP engine—complete with all accessories; engine easily disconnected for other uses. Big outlet box, voltmeter, no wiring necessary. Ample current for all purposes. Factory warranty. (Item 31) Wt. 210 lb.

Reg. price $585. Special at..... **$299.50**

Same plant with electric self starter (Item 31a) **$359.50**

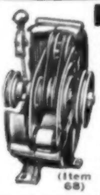
Generator only and control box.... **$169.50**

DUAL VOLTAGE 110-220 available on any of above models for $28.00 additional.

3000-3500 WATT PLANT (Item 198) 110-220 v. 60 cyc. AC Belt Drive. Wis. engine **Push Button Start.** Wt. 370 lbs. Heavy duty **$439.50**

GENERATOR ONLY for belt drive.. **$239.50**

Variable Speed Selector



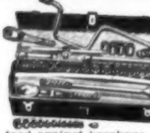
(Item 68)

Heavy duty, made by **B. F. GOODRICH** for industrial use. Provides instant speed changes for any drive. For machine tools, dryers, printing, conveyors, production lines, hoists—any operation requiring variable speed. Employs reliable "trouble free" planetary system. No hydraulic power losses. Infinite range, smooth operation, easy installation. 3 sizes: ½-1 hp. 36 lbs.; 1-2 hp. wt. 55 lbs.; 2-3 hp. wt. 105 lbs.; Reg. list $228, $252 and $352. Our prices ..... **$79.50, $89.50 and $114.50**

9 TON HYDRAULIC PRESS

A tremendously powerful hydraulic press, capable of exerting 18,000 lbs. pressure. Pays for itself many times over—straightening bent connecting rods, king pins, crankshafts, axles, link pins and bars — or pushing out frozen bearings and bushings. Developed pressure under precise control and visible at all times on accurate gauge. Complete with both large and small **anvils and** jigs to straighten **any kind** of curve or bend. (Item 464) Wt. 110 lb. Actual list price $365. Our special close-out price.... **$69.50**

52 pc. SOCKET SET



Highest quality, guaranteed non-breakable sockets made by Husky. Beautifully matched chrome thin wall alloy absolutely the best. Contains a complete set of 28 sockets in ½" drive, ⅜" drive and ¼" drive, plus all necessary extensions, handles, speeders, reversible ratchets, etc.; all uncond. guaranteed against breakage. A beautiful set of tools that will handle any job; in a **big** doghouse steel box. Wt. 17 lbs. (Item 205) List price $62.90. Factory special.. **$27.95**

HEATING & VENTILATING FAN

(Item 10) Easily installed in furnace pipes. Forces even heat to all rooms. Over range removes kitchen smoke and odors. Powerful, continuous duty motor, 110-120v. AC. Mount in wall or ceiling to ventilate any area. Quiet, super-efficient fan moves huge volume of air. (400 to 600 CFM).

8" Pipe, wt. 5 lb. **$6.85**
9" Pipe, wt. 6 lb. **$7.85**
10" Pipe, wt. 7 lb. **$8.85**
12" Pipe, wt. 8 lb. **$9.85**

HEAVY DUTY FAN. Semi-enclosed motor, suitable for spray booths, restaurant exhausts, poultry houses, etc. 10" Fan, wt. 8 lbs. (Item 10E) **$11.95**

12" Fan. wt. 10 lbs. (Item 10D).... **$12.95**

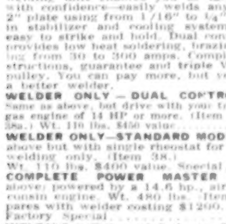
CONDITIONAIRE BARN FANS

Save big money installing your own barn ventilating fan. Efficient propellor type blade moves huge volume of air quietly and effortlessly. Heavy welded frame — predrilled for easy installation. Just cut opening and bolt in place. **Continuous duty motors.** Ideal for keeping barns and chicken houses dry and ventilated. Control manually or with thermostat.

Blade	Opening	CFM	Wt.	Item	
16"	18¼"	2925	19 lb.	365a	$27.95
18"	19¼"	3600	27 lb.	365b	$31.95
20"	21¼"	4100	30 lb.	365c	$39.95

THERMOSTATS: BARN type (range 40°-60°). Wt. 2 lbs. $6.95.

MASTER DC ARC WELDERS



(Item 280)

Now! a portable, rugged, industrial type welder with terrific performance, yet at a price hundreds of dollars less than you'd expect. Senior model made for years of trouble-free, continuous service. High capacity DC welding unit enables you to tackle any job with confidence—easily welds anything up to 2" plate using from 1/16" to ¼" rods. Built-in stabilizer and cooling system makes arc easy to strike and hold. Dual control rheostat provides low heat soldering, brazing and welding from 30 to 300 amps. Complete with instructions, guarantee and triple V-belt or flat pulley. You can pay more, but you can't buy a better welder.

WELDER ONLY — DUAL CONTROL MODEL. Same as above, but drive with your tractor, jeep or gas engine of 14 HP or more. (Item 38a.) Wt. 110 lbs. $450 value **$119.50**

WELDER ONLY—STANDARD MODEL. Same as above but with single rheostat for heavy metal welding only. (Item 38.) Wt. 110 lbs. $400 value. Special .. **$99.75**

COMPLETE POWER MASTER (Illustrated above) powered by a 14.6 hp., air cooled Wisconsin engine. Wt. 480 lbs. (Item 280) Compares with welder costing $1200. Factory Special **$449.50**

WELDING KIT Two 10 ft. leads, welding helmet, electrode holder, ground clamp. Sold only with welder at... **$10.50**

EXTENSION CORD

Heavy duty and very flexible. Neoprene 14-2 cable, 20 year quality. Wt. 12 lbs. (Item 185) 100 ft. Complete with rubber plug and outlet. A terrific buy at only **$8.95**

NO. 12-2 POWER CABLE. Very flexible rubber covered, special outside shield for grounding power tools, etc. 50 ft. (Item 199) wt. 8 lbs. **$6.95.** 100 ft. (Item 200) **$12.95**

No. 10-2 POWER CABLE. Heavy duty, very flexible, rubber covered, 50 ft. with male and female fittings. Wt. 9 lbs. (Item 592a) **$10.45** 50 ft. without fittings (Item 592) .. **$9.95**

JET STEAM MASTER

Now, a super efficient portable steam generator that produces live steam at 100 lbs. pressure in 60 seconds from a cold start! Produces large volume of high pressure steam on 2 pints of fuel oil. Instantly cleans sticky grease, dirt, rust, old paint, etc. off implements and road machinery. Pays for itself in a few weeks. Sterilizes soil. Sterilizes as it cleans—milk equipment, etc. Fully automatic—oil fired with new, built-in lifetime bronze water circulating pump. Draws water from faucet or bucket. Simple and safe—anyone can use it; built-in safety valve. Complete with 12 ft. of hi-pressure steam hose and new triple efficiency steam gun that automatically mixes in soap solution if desired. Wt. 250 lbs. Item 463. Special factory price **$329.50**

HI-FLO Centrifugal PUMP

Completely self-priming! No foot valve required. Tremendous capacity—100 gal. per min.! . . Special impeller enables pump to handle muddy or sandy water. Simple to operate—simply start engine and watch the water go. Powered by a rugged, easy-starting 2 HP Briggs engine. Prelubricated sealed bearings for years of heavy low-cost service. **Big 1½" Model.** Item 502. Wt. 70 lbs. Factory price.... **$134.50**

2" Model (150 gal. per min.) with 2½ HP engine. Item 502a. 90 lbs. Fact. Spec. **$154.50**

MASTER AIR COMPRESSOR

Tank Tested up to 500 lbs. per sq. in.

COMPARE! This is the only compressor built with a NO RUST stainless steel tank. Safe up to 500 lbs. (Item 209a) High pressure type (4 c.f.m.) Large volume of air for heavy duty service. For paint spraying, inflating truck & auto tires, greasing, sand blasting, etc. Piston type 2" bore compressor with built-in air filter. Master built with high strength alloys and precision bearings. Tank, 12"x24", 2100 cu. in. cap. Equipped with automatic switch that starts and stops motor to maintain desired pressure (up to 150 lbs.) and check valve, safety valve, gauge, shut-off valve, 20 ft. air hose and tire chuck. Beautifully balanced on ball bearing wheels and rubber tires. Don't take chances with used or surplus equipment. Our compressors are factory new and are guaranteed **SAFE**. Low factory prices. ⅓ HP Model (cap. 85 lbs.) Reg. $175. (Item 209p) **$109.50**

½ HP Model-heavy duty R.I. motor with unloader switch. (Cap. 150 lbs.) (Item 209a) **$129.50**

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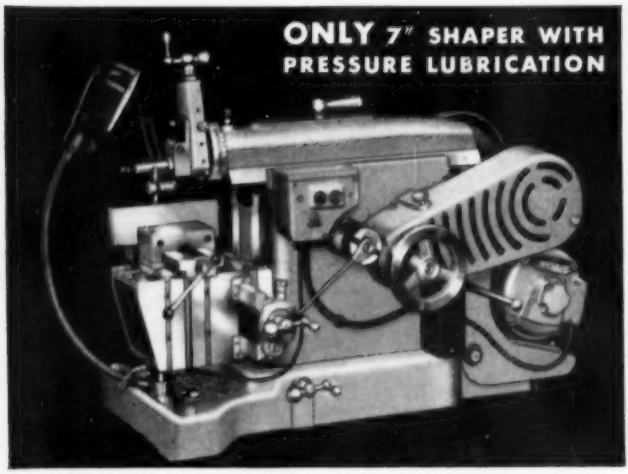

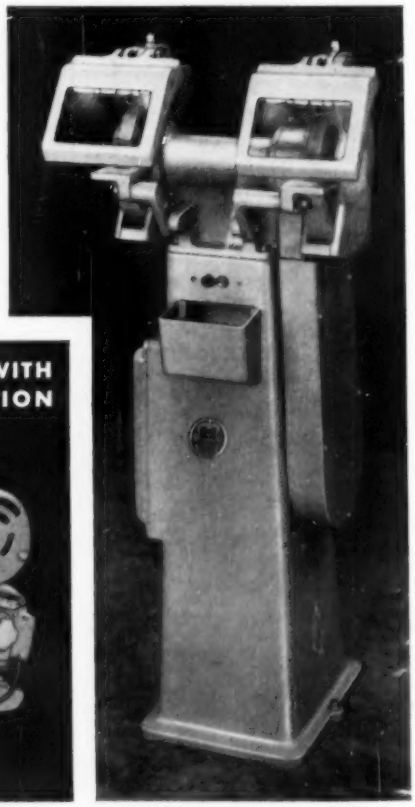

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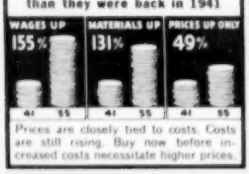

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Academic Festival Overture
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MOZART
Piano Concerto in E Flat, K 107
Artur Balsam, piano, Winterthur Symphony Orch., Otto Ackermann, Conducting

BACH
Toccata and Fugue in D Minor,
Alexander Schreiner at the Organ of the Tabernacle Salt Lake City

WAGNER
Die Meistersinger, Prelude, Act 1
Zurich Tonhalle Orch., Otto Ackermann, Conducting

DUKAS
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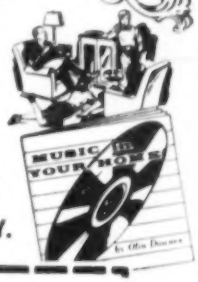

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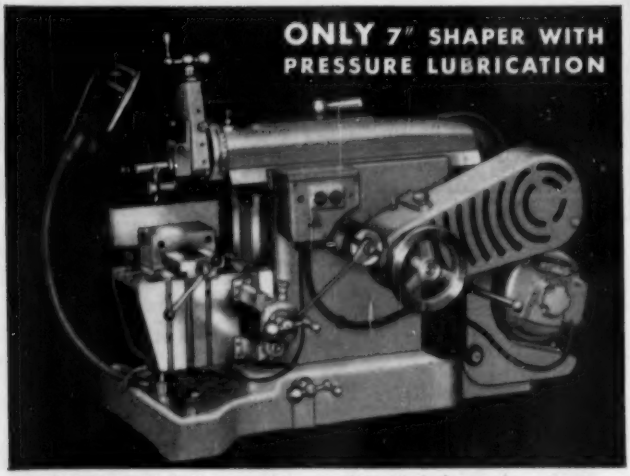

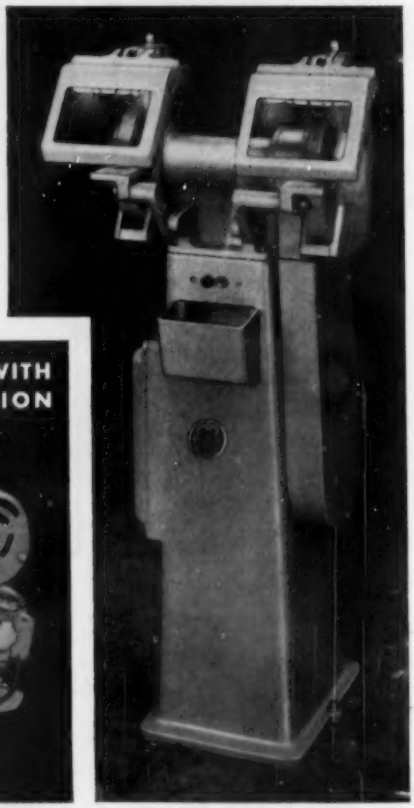

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